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Opportunity for Small Producer's Success Has Not Waned

Percentage of total output of ten leading manufacturers shows little variation in past decade. Greater concentration in few hands not likely in near future. Limited output concern must know market and offer product with distinctive character.

By James Dalton

THIS analysis of the production of the ten leading passenger car manufacturers for each of the last eleven years is designed to show that their proportion of the total output has been relatively the same for every year of this period. The logical deduction is that the small producer has just as good a chance of success today as he had a decade ago. His product must have distinctive characteristics, however, and he will have a class rather than a mass business. Success or failure will be determined largely by the degree of intensiveness with which he studies his potential market.

FOUR motor car companies which have ranked among the ten leaders annually for the eleven-year period from Jan. 1, 1912, to Jan. 1, 1923, have produced 64 per cent of all the automobiles made in the United States. Two other companies which came into the field a little later, but which have been among the leaders for the last eight years, have added 11 per cent to the total, bringing the percentage up to 75. Ten other companies which have been among the ranking ten some of these years added another 8 per cent, bringing it up to 83 per cent. Ford alone was responsible for 45.7 per cent.

Detailed figures for production in the first half of 1923 are not available, but Buick, Chevrolet and Overland as well as Ford have passed the million mark in total output and Dodge is rapidly approaching it. The aggregate of Ford's domestic production up to Jan. 1, last, was 6,195,500.

It is significant that all but one of the eighteen companies which have been included in the list of ten leaders for any of the eleven years still rank well toward the top and are strong financially.

These leaders for each year, arranged in alphabetical order, have been:

1912, Buick, Cadillac, Chalmers, Ford, Hudson, Hupp, Maxwell, Overland, Reo, Studebaker.

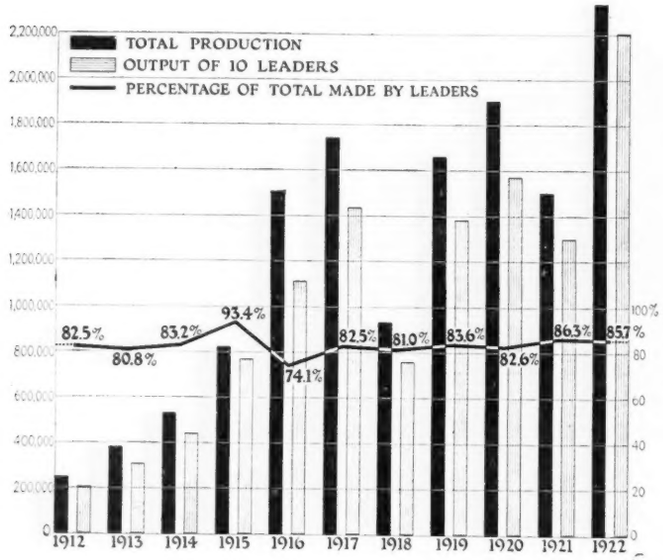
1913, Buick, Cadillac, Chalmers, Ford, Hudson, Hupp, Oakland, Overland, Reo, Studebaker.

1914, Buick, Cadillac, Ford, Hudson, Hupp, Maxwell, Overland, Reo, Saxon, Studebaker.

1915, Buick, Cadillac, Chevrolet, Dodge, Ford, Maxwell, Overland, Reo, Saxon, Studebaker.

1916, Buick, Chevrolet, Dodge, Ford, Maxwell, Oakland, Overland, Reo, Saxon, Studebaker.

1917, Buick, Chevrolet, Dodge, Ford, Maxwell, Oakland, Olds, Overland, Reo, Studebaker.



1918, Buick, Chevrolet, Dodge, Ford, Hudson, Maxwell, Oakland, Olds, Overland, Studebaker.

1919, Buick, Chevrolet, Dodge, Ford, Maxwell, Nash, Oakland, Olds, Overland, Studebaker.

1920, Buick, Chevrolet, Dodge, Ford, Maxwell, Nash, Oakland, Olds, Overland, Studebaker.

1921, Buick, Chevrolet, Dodge, Ford, Hudson, Hupp, Maxwell, Nash, Overland, Studebaker.

1922, Buick, Chevrolet, Dodge, Durant, Essex, Ford, Maxwell, Nash, Overland, Studebaker.

Analysis shows that the names of Buick, Ford, Overland and Studebaker have appeared eleven times; Maxwell ten times; Chevrolet and Dodge eight; Reo six; Hudson and Oakland five; Cadillac, Hupp, Nash and Olds four; Saxon three; Chalmers two; Durant and Essex one. Chevrolet and Dodge did not get into production until 1914 and they have been among the leaders continuously since 1915. Saxon is not now in production. All the other companies are among the big producers today.

The highest percentage of the total output made by the ten leaders in any single year was 93.4 in 1915 and the lowest 74.1 in 1916. The average has been 83.2 per cent. The detailed figures for the eleven years follow:

Year	Total Production	Output of 10 Leaders	Percentage of Leaders
1912.....	244,000	201,400	82.5
1913.....	381,000	306,000	80.8
1914.....	530,000	441,100	83.2
1915.....	822,000	768,000	93.4
1916.....	1,494,000	1,107,300	74.1
1917.....	1,740,000	1,436,300	82.5
1918.....	931,000	754,300	81.0
1919.....	1,658,000	1,386,000	83.6
1920.....	1,906,000	1,573,600	82.6
1921.....	1,500,000	1,294,100	86.3
1922.....	2,335,000	2,000,500	85.7
Totals	13,541,000	11,268,600	

The four companies which have been among the ranking ten for the last eleven years—Ford, Buick, Overland and Studebaker—had produced a total of 8,489,200 up to Jan. 1, 1923. Two others which have ranked high for the last eight years—Chevrolet and Dodge—had made 1,575,500, giving a grand total of 10,064,700 for the six.

Ford domestic production by years, beginning with 1912, has been: 68,500, 164,000, 248,000, 408,000, 534,000, 780,000, 338,000, 760,000, 920,000, 875,000, 1,100,000.

Output by the tenth company in the list of the ranking ten in each year since 1912 has been: 5700, 6000, 7000, 18,600, 25,000, 22,000, 13,000, 27,000, 25,700, 13,600, 36,000.

One important general deduction can be drawn from the production figures of the leaders for the last eleven years. It is:

The percentage of total output concentrated in the hands of the leaders was no larger at the close of this period than it was at the beginning. There is no reason to expect, therefore, a much greater degree of concentration in the near future.

As a matter of fact more companies divided the relatively small business in 1912 than the huge business of 1922. The statistical tables published by AUTOMOTIVE INDUSTRIES (The Automobile) in 1912 showed that there were 171 producing companies in the field. The statistical tables of 1922 show that there were only 125 producing companies.

Total production in 1912 was 244,000, of which the ten leaders had 201,000, leaving 43,000 to the other 161 companies, or an average of 267 each.

Total production in 1922 was 2,335,000, of which the ten leaders had 2,000,000, leaving 335,000 cars for 115 companies, or an average of 2913 each.

Obviously the investment per company was smaller in 1912, but so were the earnings. Profits may have run a little higher per unit but the volume was less than 10 per cent as large.

Hundreds of passenger car companies have come and gone in this eleven-year period, but the fatality rate now is considerably smaller than it was ten years ago. Companies were springing up almost every week as late as 1920, but relatively few of them are coming to existence now. Promoters know that they are doomed to failure unless they have substantial resources.

Small Concern Has Equal Chances

Inasmuch as automobile buyers show no greater disposition now than they did ten years ago to confine their purchases exclusively to the products of a few companies, the smaller concerns now in the field have an equally good chance of success.

Much has been written and more has been said in the last two years about "the survival of the fittest." That economic law does not apply to the automotive industry alone and it was just as difficult to escape before there were any motor cars as it is today. The fittest have survived in this particular field as they do in all fields and the most fit have had most of the business.

It is apparent that as the number of motorists has increased, the percentage of those desiring "something different" in the way of a car, although it may have been little more than the name plate, has remained virtually stationary. The experience of more than a decade shows that this percentage is not likely to diminish.

There is no reason, therefore, why all the companies now in the field which are doing any business at all and which are not too far gone financially can't remain in business provided they give anything like reasonable service. The subject of service is more important now than it was in the earlier days and much more is expected.

Such companies should not forget for a minute, however, that their problems are entirely different from those which confront concerns turning out cars in relatively large volume. These problems differ with each individual company and they must be studied not only minutely but continuously. There are no general answers which will fit all of them.

Marketing conditions are vastly different now than they were in 1912. The automobile then was relatively new. Prospective purchasers knew relatively little about

motor vehicles and almost anything that would run could be sold. Americans today are motor wise. At least 25 per cent of them know how to drive and they have a pretty definite notion of what they want.

As a prerequisite to success, the product of any small car manufacturer must have some distinctive characteristics. They may be mechanical or they may apply only to the body, but if they are to be of value they must possess a direct appeal for some class of buyers, large or small. Body designs and body fittings are more important then they ever were before. If a small producer can provide something different in the way of bodies he can be sure of a market for his product if his chassis is reasonably good. Merely as an example, he might devote himself to making an open car more attractive for year 'round use.

Given these individual characteristics, the maker must determine to what class they will appeal. He should keep it constantly in mind that his will be a class rather than a mass business. When he determines the class of buyers most likely to take his products he must study his market as devotedly as an actor studies his lines. He must know where his prospects are and how to reach them. Then he must devote himself to the problem of keeping production and marketing costs as low as is humanly possible.

If a manufacturer will do these things his chances for success are just as bright today as they were a decade ago.

Farman Designs 12-Cylinder Engine for Aviation Service

AFTER a 50-hr. bench test under the control of State engineers, the Farman 400 hp. twelve-cylinder W-type engine has satisfied all the requirements of the French Government Aviation Department and has been accepted as an approved type for planes and eligible for Government subsidies. The same engine is now undergoing a 150-hr. test.

This is the first aviation engine to be built by the Farman Company. Although building and operating planes for a number of years, this firm has, up to the present, purchased its engines from automobile manufacturers. The new engine has been designed specially from the viewpoint of the operating company with running and maintenance economy as the main considerations.

The 50-hr. test comprised eight non-stop runs of 5 hr. each and a final 10-hr. non-stop run. Each run included 15 min. at 400 hp., 4 hr. 30 min. at nine-tenths of the power developed during this trial, and 2 min. at the maximum of 440 hp. at 1860 revolutions.

The trials were carried out in the Farman laboratory, which is fitted up in such a way that all the readings can be taken from a sound-proof cabin opposite the engine under test. From this cabin the State engineers had the engine under direct observation and readings were taken at intervals of 10 min. throughout the 50 hr. Engine speed, as shown by the tachometer, was checked up with the totalizer and a chronometer, the weight lifted was read off, and temperature of oil and water were taken, also gasoline consumption.

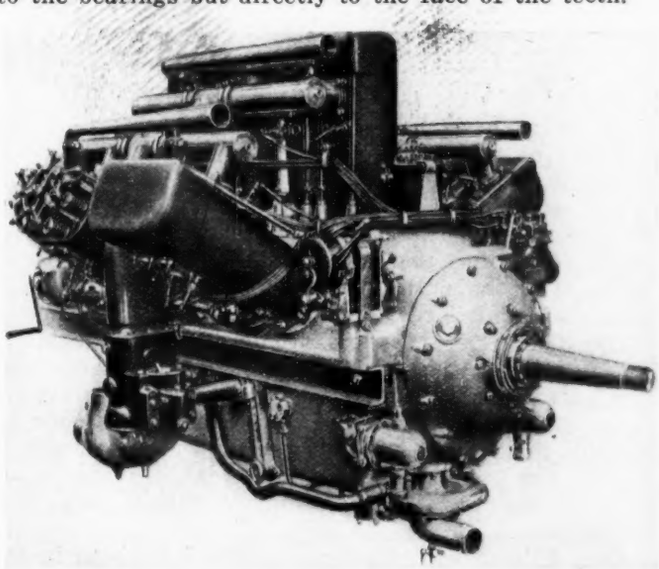
There was practically no variation in the power output and on the last 10-hr. test the engine was developing more power than when it went on the bench. On the last of the eight tests of 5 hr. duration the engine developed 413 hp. during the first 15 min. and maintained 363 hp. at 1730 r.p.m. without a variation until the last 2 min., when it was speeded up to 1860 r.p.m. and developed 441 hp.

The new Farman has three rows of four cylinders, forming a W, with a bore and stroke of 130 by 160 mm. The cylinders are steel forgings with four vertical valves operated by pushrods and rockers. Among the features dictated by aviation experience are two independent ignition systems by magneto and Delco; carbureters are on the outside of the engine, fed by two gasoline pumps in parallel, each one being sufficient to supply all the fuel necessary for the engine.

The gasoline pumps start up with the electric engine starter and maintain a pressure on the line. Starting is by electric motor having a reduction of 80 to 1, the starting being facilitated by a hand vaporizer. There is also a geared-down hand crank connected with a starting magneto. The electric generator, driven directly off the crankshaft, is in tandem with a high frequency alternator supplying the wireless transmitting set. The dynamo, which develops 1200 watts, delivers its current into a 24-volt 40 amp.-hr. battery.

This high electric power has been considered necessary in order to transmit messages if the plane should be forced down with the engine stopped. In such a case the generator is declutched from the engine and is used as a motor, with current obtained from the batteries, to drive the alternator.

The lower portion of the engine base chamber, forming oil reservoir, is independent of the rest of the engine. There are four oil pumps; the main pump delivers oil under pressure to the main bearings and through the hollow shaft to the connecting rods; two scavenger pumps, one at each end of the base chamber, return the oil to the main tank, and a fourth pump circulates the lubricant through an oil radiator. There are two independent oil filters, either one of which can be withdrawn for cleaning while the engine is running. The propeller is geared down in relation to the engine shaft by a bevel pinion differential gear with a delivery of oil not only to the bearings but directly to the face of the teeth.



Farman twelve-cylinder W engine for aviation service

Exceptional Durability Is Claimed for New Body Finish

Product called "Duco," made from cellulose, is developed by Du Pont Co. for use in place of color varnish. Rapid drying without baking and ease of application among advantages. No rubbing between coats required. Gives satin or glossy finish.

By Herbert Chase

ONE of the most serious problems which faces the automobile industry today is that of improving the finish of both open and closed car bodies in such a way that it will be at least as durable and cause the user as little concern as the great bulk of other materials and parts used in the construction of the finished product. That present finishing materials are far from satisfactory from the standpoint of durability and time required in producing the finish is readily and generally admitted even by the manufacturers of these materials. It is no secret that much research work has been done and great sums of money expended to develop improved finishing materials and methods.

In view of this situation great interest is being manifested in a new product termed "Duco," intended for use in the final coats of finishing, which has been developed by E. I. du Pont de Nemours & Co., Inc., working in cooperation with various automobile manufacturers. It is claimed that this enamel is both more durable and more rapidly applied than the usual finishing materials with the possible exception of japans which require baking at high temperatures and are available only in black.

Among the desirable qualities claimed for this new product, aside from its durability and rapid drying character, are: ease and rapidity of application, ability to withstand abrasion, and resistance to deterioration, especially under conditions of alkali dust which are encountered in some parts of this country and result in rapid deterioration of all commonly used automobile finishes.

Use of Many Colors Possible

One of the important effects which the use of Duco is expected to have in the automobile field is to increase rapidly the number of colored cars which will be produced in practically all price classes. Most manufacturers, especially those making the lower priced cars, have heretofore concentrated chiefly on cars finished in black, owing to the fact that black lends itself readily to rapid artificial drying or baking, whereas other colors are, in general, much less readily or rapidly applied. The makers of Duco expect it will work a complete change in this respect except, perhaps, in the case of a few large production cars the bodies of which are designed to be dipped in japan and baked at much higher temperatures than are possible when colors are employed or where wooden body frames are used. Duco can, however, be made in any color or shade and dries very rapidly without the application of heat.

Cars finished with Duco are said to have been in constant use for two years without showing check or crack. The writer was shown one of these cars and the finish appeared to be still in very excellent condition. Accelerated aging tests are reported to indicate that the life of Duco finish is from six to eight times that of most other finishing materials.

Duco is said to cover about the same number of square feet per gallon as varnish. In wholesale lots it sells for slightly under $4 per gal. or about the same as high grade color varnishes. The chief saving incident to its use is that due to the small amount of time required in drying and applying. This saving has reduced the finishing time on one high grade car from about 30 to 16 days. In the case of low cost large production cars, in the finish of which rapid artificial drying is employed, the saving in time is less in proportion but still a considerable item. In one case of this character the finishing time has been reduced from six to somewhat less than five days.

Duco Substituted for Color Varnish

Duco is the name applied to a pyroxylin base lacquer or enamel to which is added a coloring pigment which renders the product suitable for use in place of a color varnish. "Viscolac," which is substantially identical with Duco except for the coloring pigment, is a clear liquid suitable for use for the same purpose as high grade varnishes, but no final coat such as is generally employed for finishing over color varnishes is required over Duco.

While Duco as applied, without rubbing, gives a pleasing egg shell finish, it is readily rubbed to a high polish by using pumice and rotten stone and using a finishing coat of polishing wax. This finish does not give quite so high or "hard" appearing lustre as is obtained with a finishing varnish, but if a high lustre is desired, this is easily obtained by a single coat of clear finishing varnish.

In the finishing process Duco is merely substituted for color varnish and applied with about the same number of coats as are used with color varnish, so far as cars in the lower price classes are concerned. In the case of the higher priced cars, however, a smaller number of coats of Duco are said to be required to give a finish comparable to that formerly secured only by several coats of other finishing materials.

Duco eliminates all rubbing varnishes which are slow drying and the least durable of all the varnishes. Besides drying more rapidly, Duco requires no rubbing between coats.

The basic ingredients of Duco are entirely different from those used in other common automobile finishing materials. Duco is made from a pyroxylin solution to which is added a solvent in the form of amyl acetate, commonly called banana oil, and a pigment plus a small quantity of non-drying vegetable oil. Pyroxylin is a derivative of cellulose or cotton which has been rendered soluble by treatment with nitric and sulphuric acid.

Pyroxylin lacquers or enamels are by no means a new product. They have been manufactured for many years and used to a limited extent for automobile finishing, especially in localities where alkali dust has caused varnished jobs to deteriorate rapidly. As heretofore manufactured, however, these lacquers have contained less than 10 per cent of solid matter. Since the solvent evaporates rapidly upon application of the lacquer, leaving only the small percentage of solid matter, several coats were necessary to give a good finish. Duco differs from lacquers or enamels heretofore manufactured by the du Pont company in that means have been found to dissolve in it from 34 to 45 per cent of solid matter without rendering it more viscous than color varnish. Two or three coats of Duco are said to be enough to give a solid color of sufficient body for rubbing to a finish surface.

Application by Air Brush

Duco is applied by spraying with any one of several standard makes of air brush. The brush is held at right angles to the work and best results are obtained by starting at the bottom of the panel and working upward, the reverse of the method employed in spraying varnish. This is due to the fact that because of its rapid drying qualities, Duco does not flow as does varnish.

From 20 to 30 per cent of a thinner, consisting largely of amyl acetate, furnished also by the du Pont company, is employed in the average case. An overhead type of feed to the air brush is recommended on account of the more uniform flow thus secured. An air pressure of 40 to 60 lb. per sq. in. is used. Uniformity of feed is important in order to secure a uniform coat and thus reduce the time required in rubbing. Duco is applied at ordinary temperatures, and should be allowed to attain such a temperature if for any reason it has been stored where the temperature is lower than that of the room.

Over 50 colors of Duco have been developed, and of these only one of the blacks dries with a gloss finish. The colors employed are ground in pyroxylin solution.

It is recommended ordinarily that from 15 min. to one hour of air drying be allowed between coats, but cars have been successfully finished with Duco by working around the car once and following this immediately by a second and third circuit in which additional coats were applied. As indicated above, no rubbing is required except to give the desired finish to the final coat.

Surface Not Easily Chipped

When rubbing is to be done the final coat is allowed to air dry over night, say for about 12 hours, in most cases. No heating is required, but one manufacturer who already has drying equipment is planning to use these ovens to dry the final coat for about 15 min. at 150 deg. Fahr. in order to permit of rubbing sooner than would be possible otherwise. If rubbing is attempted before the final coat is fully dried, sinking, or further contraction of the coating, causing some unevenness, is apt to result.

Rubbing is accomplished with pumice and water (or pumice and oil if desired), followed by rotten stone and water or oil, the same method being employed that is used in the final rubbing of varnish jobs. If wax is to be used to give a lustre, the finest grade of rotten stone is employed in the rubbing. An ordinary polishing wax such as sometimes is used in rubbing up cars after several months of service is employed. This wax, of course, wears off in time but rewaxing can be done easily. The polish of Duco is said to become higher with use. The surface of the Duco is exceedingly hard and cannot be scratched or chipped easily.

The same priming coats and rough stuff which are employed with varnish are recommended for Duco. It is recommended also that the rough stuff be baked in order to insure complete oxidation of the linseed oil. This is because of the fact that the thinner used in Duco is the same material used in some paint removers, consequently, unless the linseed oil is fully oxidized, the rough stuff is apt to be loosened.

Action of Alkalis Resisted

Duco must be well stirred prior to its use and an efficient strainer must be employed in the air line to prevent oil or water from mixing with the Duco as it is sprayed. Of course the surface to which the Duco is applied must be perfectly clean and free from oil. It adheres with great tenacity to both metal and wood.

When a very high lustre is desired for the final coat a good grade of finishing varnish can be used over Duco. This varnish is said to be much more durable over Duco than when applied over rubbing varnish. This property is attributed to the fact that Duco is impervious to varnish and is not soluble therein so that the varnish all remains on the surface.

Duco is designed for use on chassis and fenders as well as on bodies. It is claimed to be more durable than some baked enamels and to adhere just as well to the surface. It is realized, however, that Duco may not be able to compete in first cost, at least in some cases, with japan applied by dipping and baking, even though Duco requires no baking. In other cases it is preferred to japan on account of the fact that no baking equipment is required so far as the coats of Duco are concerned.

While the solvents used with Duco are themselves inflammable the coating when dry is non-inflammable. A car finished with Duco is said to be much more easily cleaned than one finished by ordinary methods.

Duco is not affected by gasoline or hot or cold water and resists the action of alkalis. It can, however, be spotted by alcohol and can be readily removed by dissolving with amyl acetate.

Flywheel Magnetos Tested

COMPARATIVE tests of so-called flywheel magnetos and the standard type of rotary armature, U-shaped magnet magneto have been made by Curt Hanfland, and the results are given in a recent issue of Der Motorwagen. The flywheel type of magneto was originally used for outboard marine engines, but lately it has been used in Germany to a considerable extent in connection with small engines used for converting pedal bicycles into motorcycles.

Voltage and short-circuit current measurements at 1000 r.p.m. were made on four designs of flywheel and two designs of conventional magnetos. The flywheel magnetos contained an average of 10.2 cu. in. of magnet steel, and 5.2 cu. in. of winding space, and they gave an average of 4.2 volts and 1.38 amperes or 5.796 watts, whereas the conventional magnetos with an average of only 7 cu. in. magnet steel and 3.2 cu. in. of winding space gave an average of 6.8 volts and 1.56 amperes or 10.6 watts.

It will thus be seen that the conventional magneto greatly excels the flywheel type in efficiency from the standpoint of output per unit of bulk or weight. The reason for this is believed to be that owing to the much larger armature diameter of the flywheel magneto the air gap must be made larger in order to ensure equally reliable operation, with the result that for a given amount of magnetic material a smaller flux is obtained.

An additional disadvantage of the flywheel type of magneto is said to be that it is impossible to apply a magnetic bridge to the pole shoes if the armature is removed, which results in loss of magnetic strength.

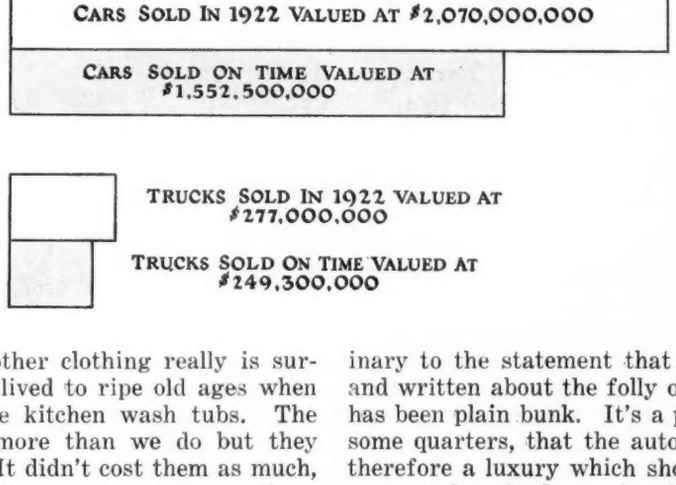
Time Sales of Automobiles Have Reached Enormous Proportions

Americans Get Their Cars While Thrift Essayists and Embryo Economists Writhe

AUTOMOBILES are not non-essentials. In most cases there is ample justification for buying them on installments. They return greater dividends than would the same amount invested in anything else. The average buyer is pretty sane and knows what he can afford. He does not ask for an unreasonably long period in which to pay.

A GOOD many embryo economists and a large proportion of the rather numerous authors of thrift lessons, take the position that the person who buys an automobile on the installment plan is a reckless, extravagant person likely to spend his declining days in the poorhouse. They appear to view with alarm the rapidly growing army of motorists who buy on time something they could get along without.

Relatively few things in life are absolute essentials to continued existence. We must have a reasonable amount of food, a few clothes and a place to sleep. Unhappily, there are a good many people in the world who have considerable difficulty in getting even that much. They consider extraordinarily lucky those happy individuals, especially Americans, who don't have to worry about "three squares" a day.


CARS SOLD IN 1922 VALUED AT $2,070,000,000
CARS SOLD ON TIME VALUED AT $1,552,500,000
TRUCKS SOLD IN 1922 VALUED AT $277,000,000
TRUCKS SOLD ON TIME VALUED AT $249,300,000

Everything except food, clothing and shelter is relatively non-essential. Many of us have more of these three than we actually need. Every man could get by with one suit and every woman with one dress. All other clothing really is surplus baggage. Our ancestors lived to ripe old ages when their baths were taken in the kitchen wash tubs. The same forebears probably at more than we do but they didn't have as much variety. It didn't cost them as much, either, for "great open spaces" were no myths in those days and they didn't have to patronize the corner grocer or butcher.

THEN there's the servant problem. Our well-known ancestors, or at least a good many of them, just went out and grabbed a servant or bought one. There wasn't much fretting about the wage scale. But most servants are non-essential and always have been. There's no real reason why the woman who presides over a home can't do her own work, provided she's healthy. If she can't the family must have more shelter than is absolutely essential.

Coming down to the fine arts, which have been recognized in good society since the Paleozoic age, there's no real need for musical instruments. A good many of us could get along more comfortably if our neighbors didn't have so many. And yet the piano, which descended from the harpsichord, has been a household joy for many generations. The piano, generally speaking, has been sold on time and always will be. But it hasn't been considered an extravagance to buy a piano on installments because it is supposed to do something ennobling to the soul of little Johnny or tiny Mary.

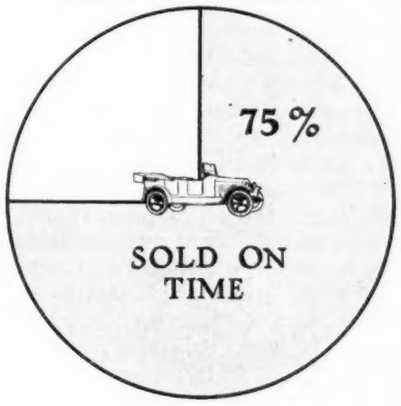
IT'S the same with player pianos and talking machines. Almost all of them are sold on time. Even the humble cottager is supposed to be entitled to the soul comfort afforded by a phonograph. The degree of comfort added may be open to argument but economists don't view the purchase with alarm. Nevertheless, the cottager could get along without either a voice or a music reproducer. They aren't real essentials. Even ownership of a cottage isn't essential although it usually is considered commendable.

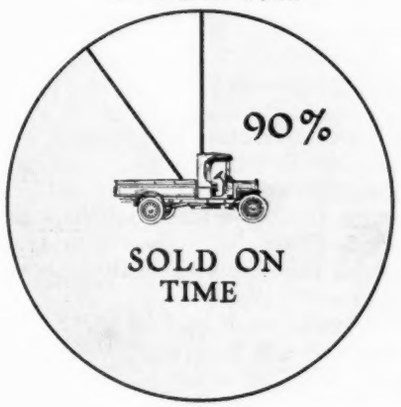
All of which is preliminary to the statement that much of what has been said and written about the folly of buying automobiles on time has been plain bunk. It's a part of the belief, still held in some quarters, that the automobile is a non-essential and therefore a luxury which should be shunned unless a person can buy it for cash without making an appreciable dent in his bank account.

Practically everything we buy except food, clothing and shelter, as we have said before, is non-essential. Carrying the argument to the point of idiocy frequently reached by opponents of automobiles, the telephone, telegraph, gas, electricity, the typewriter, tractor, trolley car, railroad and almost everything else, while highly utilitarian, are non-essential. They have increased productivity enormously, they have raised standards of living to an extent which would have been unbelievable a few years ago and they have made present industrial methods possible. But countless millions of people lived countless centuries without them. The automobile ranks in the same category. Nevertheless, all these things were counted luxuries in our grandfather's day.

Anything which permanently raises a nation's standard of living is not a luxury. It adds not only to national wealth but to the wealth of individuals and the most highly civilized nations always have been the wealthiest because wealth has enabled them to acquire culture and knowledge. As a present-day example, Russia never can take the place to which she is entitled in the family of nations until all these inventions which have marked human progress become much more widely distributed among her population.

IT may seem rather a far cry from the subject of essentiality to that of thrift, but it is not. The great mass of the people would be able to possess only a few pristine luxuries, which are today regarded only as comforts, if they had to pay cash for them. Most of those housewives who have greatest need for sewing machines and washing machines and gas stoves would be unable to pay for them all at once. No sane person will deny that these things are twentieth century essentials. Going a step further, relatively few people would own pianos and talking machines if they had to pay cash for them.





True thrift is concerned chiefly with relatively small expenditures. Speaking generally, it is thriftless to go into debt for food or clothing. Charge accounts at stores wreck the finances of more families than the time purchase of automobiles.

Thrift is a highly exemplary characteristic, but the person who limits himself and his family to the bare necessities of life and stows the rest of his income in a bank or a tin can or a woolen sock leads a dreary life. Even if he acquires comparative wealth it will give him little pleasure because he won't know what to do with money except save it.

Then there is another class of individuals who stint themselves to save money with which to speculate. They would regard an automobile as a wild extravagance, but they are perennial investors in oil stocks.

Few persons acquire actual wealth without having been in debt much of their lives. Buying Liberty bonds for patriotic purposes taught thrift to more persons than anything else in the history of the country. They went into debt and then learned to save systematically. It's systematic saving for a definite purpose which pays debts and which leads to the accumulation of property. Only in this way could the average run of Americans buy their own homes. Mighty little real estate is sold for cash.

Except when it is used chiefly for business purposes, the automobile doesn't return actual dividends as do sound investments in stocks, bonds, mortgages and real estate, but to the average installment plan buyer it returns an indirect dividend more important than he would get from the investment of the same amount in anything else.

The normal person believes in getting as much comfort as possible out of life as he goes along. He is the one who buys an automobile on time. Taken by and large, he is a pretty sane individual. He knows that a motor car has a highly utilitarian as well as a highly recreational value. He realizes that there are few cars in use which don't add, directly or indirectly, to their owner's earning capacity.

Mr. Normal Person doesn't regard the automobile as an investment in the same sense as a house. He wants both, but if a home is impossible immediately and a car isn't, he'll get the car, although he wouldn't sacrifice a home just to own an automobile. He knows better than anyone else what he can afford and what he can't afford. He will determine in advance whether he can meet the payments as they come due without endangering unduly his personal finances. He won't be likely to ask for eighteen months or two years to complete his payments.

Exceptions can be found, of course, to any general rule. There, doubtless, are a great many persons driving automobiles who can find no economic justification for their ownership. They have no sense of proportion. If they suffered the slightest reverse they probably would have to sell the car for what it would bring to tide them over. But when automobiles get into the hands of such thriftless people it usually is the fault of the dealer who didn't discover until too late that they constituted a real moral hazard. Before a dealer sells a car on installments, he ought to know whether the prospective buyer can reasonably afford it. Naturally, there's a limit to all things, even the justification for buying motor cars on time.

A great majority of the American people work for salaries or wages. Most of them have savings accounts. These surplus funds have been accumulated for emergencies, such as the proverbial "rainy day," or for investment. It would be foolhardy for them to dip into these savings for the purchase of an automobile, a piano, a talking machine or anything else they didn't actually need.

On the other hand it would not be foolish for them to purchase these things out of current earnings if they could still add a little to their savings. Radicalism feeds on discontent and discontent is bred of lack of those comforts and conveniences possessed by our neighbors. There never will be a "dictatorship of the proletariat" in the United States so long as our standard of living is as high as it is today. No invention ever has done so much as the automobile to raise this standard.

The automobile has made life worth living for millions of Americans. It has been the chief means of depopulating insane asylums in rural districts and yet there are persons who tear their hair because farmers and their families spend so much time in their cars. Most farmers are always in debt and comparatively few of them would own motor cars if they couldn't buy them on time.

THE automobile has made it possible for millions of city dwellers to buy suburban or country homes. It has had a potent influence in making Americans a race of

home owners. It is doing more every year to relieve urban congestion and take the sordidness out of city life.

Persons who bemoan time purchases of motor cars must be devoid of imagination or they must have mighty little conception of what the motor car has done for the American home and American business.

Henry Ford isn't regarded generally as a philanthropist or as an economist, and there are those who wonder why so many people seem to think he would make a good president. The answer is comparatively easy. He believes the mass of the people should have as many comforts as possible and he proposes to place as many of these comforts as possible within reach of the people. He has profited enormously by giving millions of Americans individual transportation, but they don't begrudge him his profits because he has made life more worth while for them. By means of his "Christmas savings" plan he has made it possible for still more to buy cars out of current earnings without touching their savings at all.

QUITE regardless of the moans of embryo economists and writers on thrift, the buying of automobiles on installments is going right ahead and it has reached enormous proportions. Even the industry has little conception of the magnitude of this business.

Only 25 per cent of the passenger cars sold in this country are sold for cash.

Only 10 per cent of the commercial vehicles sold are sold for cash.

Approximately 2,300,000 passenger cars were sold in the United States last year. It is estimated that the average selling price per car is $900. This gives a total of $2,070,000,000. The value of the cars sold on time, therefore, was $1,552,500,000.

Approximately 252,000 trucks were sold in 1922. The average value of a truck has been fixed at $1,100. This gives a total of $277,000,000. The value of the trucks sold on time, therefore, was approximately $249,300,000.

On this basis the total value of the motor vehicles purchased on the installment plan last year was $1,801,800,000.

Time purchasers usually pay down one-third of the selling price, which would have been $600,600,000, leaving $1,201,200,000 to be carried by finance companies, banks and dealers.

The percentage of passenger car purchasers who fail to complete their payments is surprisingly small and their paper is uniformly good. The paper given by truck buyers, on the other hand, is considered the poorest in the market.

These figures give some idea of the important part played by finance companies in the retailing of motor vehicles, for they handled by far the greater part of this business. Sales financed by the forty-eight members of the Automobile Finance Credit Men's Association last year approximated $1,000,000,000 and the General Motors Acceptance Corp. handled another $200,000,000. This does not include all the finance companies.

Members of the Automobile Finance Credit Men's Association financed the sales of 61,029 vehicles in June and 61,059 in May. This organization covers only the territory from Boston to the western boundary of Ohio and south to New Orleans.

THIS business includes cars in every price class, from the highest to the lowest. The percentage of Fords sold on time is even a little larger than that of other cars.

In the final analysis the American people usually get what they want. They have demonstrated beyond all doubt that they want automobiles. They have evidenced with equal force that they are going to buy them on the installment plan. Nothwithstanding the theories of economists and thrift experts, the mass of the American people are usually right in their conclusions and the time-sale system is unquestionably sound. J. D.

Packard Now Supplying Reground Cylinder Blocks to Dealers

THE Packard Motor Car Co. is now furnishing reground blocks to dealers, allowing credit on blocks requiring this service work which are turned in to the factory. This method of handling the regrinding situation has been adopted by the Packard company to make certain that a proper fit is obtained between the pistons and cylinders. The reground blocks are sent out by the Packard company with the pistons and pins in place, so that the factory has absolute supervision over the fit of reground jobs.

It has been found that a great many service stations are unable to carry a sufficient stock of pistons to provide a proper selective fit for them in the reground cylinders. Even if a good job of grinding has been done, it is necessary to secure a piston which matches the individual cylinder bore. This is possible at the factory or in large shops, but in the smaller shops it is, of course, not so easy. Very frequently it is necessary to perform long and expensive lapping operations to secure a satisfactory fit.

The Packard company is furnishing the ground blocks in three sizes. These are standard, .020 in. oversize and .040 in. oversize. These blocks are provided with the pistons fitted in place and the latter are equipped with piston pins. The piston pins in the standard size blocks are standard; those in the .020 in. oversize are .003 in. oversize and the piston pins in the .040 in. oversize block are .006 in. oversize.

Because of the factory's ability to make one set-up on the machine for this work and because of the quantities handled in the service grinding department, the Packard company states that it is able to compete with grinding shops and, at the same time, turn out a more uniform product. In zone one, which is the zone included east of the Mississippi and north of the Mason and Dixon line, the material charge on the reground blocks fitted with pistons and pins is $49.50, including freight charges.

The average owner would, of course, like to be able to send his cylinder block back to the factory for regrinding if he could afford the loss of the use of his car for perhaps a month. With the arrangement adopted by the Packard company, the same results are obtained without the delay. The dealer is furnished with a supply of reground blocks which he has on hand and for which he is charged. When he takes in a block to be reground, he replaces it with one of the factory reground blocks and sends the worn block back to the factory. Here he is allowed for the worn block, provided it is in such condition that it can be reground. Incidentally, in this way, the owner is protected absolutely against pirate pistons and piston pins. The factory equipment consists of six Heald grinders.

Flat Springs and Hotchkiss Drive Favored in Bus Design

Wide, thin leaves preferred to narrow, thick ones. Important to use means for fastening springs securely to axle. Substitution of rubber blocks for metal shackles considered desirable. Track and wheelbase are largely determined by operating conditions.

By Alfred F. Masury
Chief Engineer, International Motor Co.

VARIOUS types of progressive spring arrangements have been devised and tried out in order to provide sensitive spring action when the bus is running with only a few passengers, as well as plenty of capacity for full loads. Springs of this sort work fairly well on paved streets at moderate speeds, where violent rebound is not to be expected; but for the rough-and-tumble work of the suburban and inter-city route, it is to be feared that the relatively small number of leaves contained in the upper or light-load spring is insufficient to hold the bus down or prevent injury to the spring in cases where severe rebound is to be experienced.

Various schemes have been put forward involving departures from the simple compression leaf spring for giving a graduated or geometric deflection to the spring. The object of such schemes is to give a very soft spring for the first inch or so of deflection and from there on to increase steadily the deflection per unit of weight until a point is reached at which the spring is exceedingly stiff, without involving an excessive amount of deflection from one extreme to the other. Many such arrangements, however, have involved systems of levers and moving joints operating under high stress and offering serious problems in resisting wear, friction and rattling, and providing for lubrication. Hence the semi-elliptic spring still remains the best compromise between all of these different types.

The type of spring which offers the greatest sensitiveness is unquestionably the flat spring. Slow periods of oscillation are the result of spring length. Resistance to excessive rebound is secured by a combination of these two features with adequate rebound clips and the maintenance of a dry, but not rusty or rough condition between the leaves. Springs with wide and thin leaves of high quality material, properly tempered, have longer life, less tendency to settle and, due to increased inter-leaf friction, better damping characteristics than narrow, thick-leaved springs.

The more closely a spring approximates a mean between the plane of the center of gravity and the center of support, i. e., the center of the axle, the less tendency it will have to permit sidesway. This position is best secured by mounting the spring flat on top of rather than underneath the axle.

Few people realize to what extent a simple semi-elliptic spring can be made to possess the characteristics of a so-called progressive spring. Referring to Fig. 1, it is seen that the resistance of the spring to deflection is largely determined by the angle at which the deflecting force acts. The spring will bend most easily if the force is applied at right angles to the mean plane of the leaves. In the case of a flat spring, this force will act at right angles to the main leaf. As the angle is changed, in either direction, the force acting on the spring can be resolved into two forces, one component acting across the leaves and another approximately parallel to them. As the bending component is less than the force applied and as the spring is practically rigid under tension or compression of the leaves, the spring has a smaller deflection under angular forces than those falling at 90 deg. to its leaves.

In the cambered spring, as in Fig. 2, we therefore have a progressive spring, but unfortunately it "progresses" in the wrong direction. Under light loads, the force bearing on the spring acts at an oblique angle to the leaves, while full resiliency is obtained under full load, when the spring is flat. The flat spring, on the other hand, as shown in Fig. 3, is flat under light load and therefore most sensitive at that time. Its deflection, inducing a reverse camber, causes the force to be applied at increasingly oblique angles and so building up resistance to deflection progressively with the load. This effect, of course, can be increased if the spring is formed with a reverse camber, so that under full load it has a decided downward bend.

Spring shackles also have a considerable influence upon the effective deflection of the spring suspension as a whole. A given spring is apt to have a very different behavior with one type than it has with another type of shackle and must accordingly be adapted to the type of shackle to be used.

At their best, however, spring shackles are generally unsatisfactory, as the high pressures bearing upon the

IN this, the second of two articles by A. F. Masury, prepared especially for AUTOMOTIVE INDUSTRIES and dealing with some fundamentals in bus design, the author discusses spring suspension, dimensions for track and wheelbase, the use of Hotchkiss drive, and considers briefly the subject of body construction.

As in the first article, the views expressed apply primarily to a 2-2½ ton chassis, which the author considers the best type for the largest present market.

Readers are invited to submit discussion of the views here expressed, with a view to its use in the Forum.

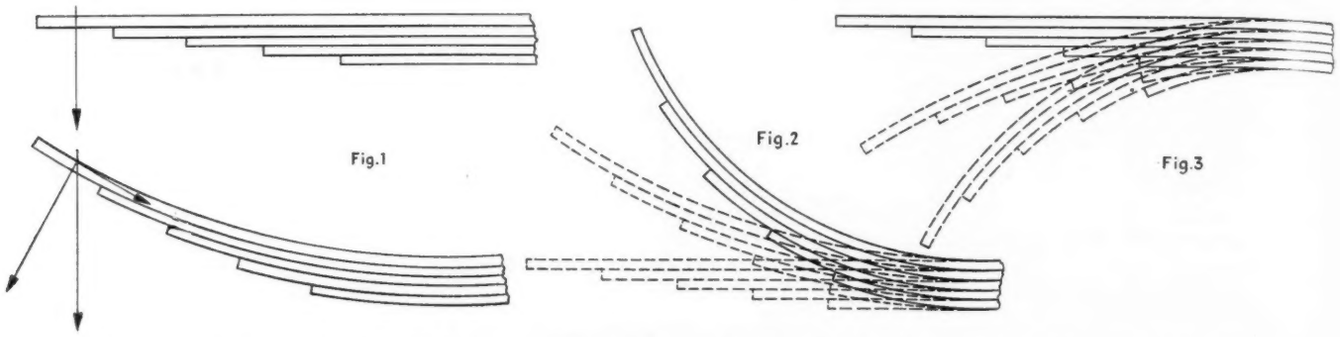


Fig. 1—All of load on a flat spring is at right angles to leaves. Load on a curved spring produces one component at right angles to leaves and another approximately parallel to leaves. Fig. 2—Cambered springs are stiffer under light than under heavy load. Fig. 3—Flat springs have greatest resiliency under the lightest load and become stiffer as load increases

necessarily small rubbing surfaces acting in oscillation rather than rotation, in positions exposed to much road dirt and water, yet inaccessible to the washer or oiler, combine to produce impossibility of proper lubrication, short life, noise, rattling and vibration, frequent failure through crystallization and rather high cost of re-bushing. A great deal of spring breakage can be traced directly to stiff or frozen shackles, resulting sudden shocks falling full upon the springs made rigid by the failure of the shackles, instead of being eased by their resiliency.

If for no other reason than the elimination of the crank-arm action and the unsatisfactory maintenance features of spring shackles, current development of yielding types of spring-end connections are worth while. In addition to this, those of the rubber block compression type, now being used on two makes of buses, offer silence, longer life and easier and cheaper renewal than shackles, superior ease of riding, absorption of the minor road vibrations and greatly augmented tire mileage. These latter advantages have been learned by experience alone, the intent in the design being merely the elimination of wear, noise, and lubrication.

The explanation is to be found in the ability of large bodies of rubber, given space in which to flow, to absorb shocks and minute vibrations, its characteristic slowness in recovering from deformation, thus imparting valuable damping effect on the springs, and its ability to accommodate itself in shape to the stresses imposed upon it, thus permitting the springs to twist in the rubber instead of in themselves.

The track of the vehicle, again, must be determined by the conditions under which the bus is to operate. For use in cities, a wide tread is undoubtedly advantageous—as wide as possible without causing the wheel hubs to project beyond the outer edges of the body. Such width not only gives the bus stability, less tendency toward sidesway, and permits the high center of gravity incident to double-decked construction, but it spreads the wheel boxes farther apart, thus making them less of an encumbrance and allows a wider frame to be used.

Wide Tracks Often a Disadvantage

Such wide tracks, however, are often at a great disadvantage under suburban and rural conditions because of narrow roads and the fact that a wide track increases the turning radius by placing the off front wheel farther from the turning center on a given wheelbase.

For the type of bus here under discussion, no upper deck need be considered, and the extremely low floors typical of the modern type of city bus are also out of the question. Therefore the need of a wide track is less pronounced, while the necessity for as nearly standard track as possible for convenience on suburban and rural roads may exclude the wide track entirely.

A long wheelbase undeniably makes for easier riding and less tendency to skid; but it also cuts down the turning radius, increases the weight of the vehicle and, if carried to extremes, disturbs the load distribution between the two axles. Experience has shown that, with the type of bus now under consideration, the rear axle is best placed about a third of the body length from the rear end of the frame, giving a wheelbase of about 16 ft. This permits of a turning radius of less than 42 ft., the greatest that may be considered practicable for suburban operating conditions with standard type of front axle. Special types of front axle can be devised to permit a greater lock of the front wheels, but such construction is of doubtful value because of the severe strains imposed on the wheel, the bearings and the steering spindle.

Drawbacks to Excessive Overhang

There are three main drawbacks to excessive body overhang: first, such construction leads to rough riding on the rearmost seats due to the fact that the overhanging portion of the frame acts as a multiplying lever to increase the amplitude of the body's rise and fall; second, on turns an overhanging body swings out to such an extent that there is danger of side-swiping vehicles alongside; and, finally, the distortion of the body due to frame weaving is more severe where the rear of the body is any considerable distance back of the rear axle. Moderate body overhang is, of course, the complement of a long wheelbase. Under no conditions should the body sills be allowed to overhang the frame.

Hotchkiss drive is certainly an advantage in bus work, as well as in ordinary truck construction. The advantages of a flexible, cushioned drive have been too thoroughly discussed to require more than brief notice here. Flexible application of power relieves the entire chassis and power-plant of solid shock, assists in better acceleration by providing a gradual overcoming of inertia, provides less tendency for the wheels to spin on slippery footing when starting or to slide in braking, tends to eliminate rattling, friction and need for lubrication of a number of parts, and saves the clutch from considerable wear due to the elimination of the greater amount of slipping required for an easy start with rigid drive.

In giving consideration to this subject, however, it must be understood that by Hotchkiss drive is not meant the mere elimination of radius and torque members without profound changes in the spring suspension. Hotchkiss drive is not a negative term; it is not the mere lack of members, it is a positive term, denoting the presence of certain differences in the suspension of the driving axle. It requires springs of the very highest grade, a top leaf somewhat thicker than the others without being too thick and tied to the shorter leaves by the most effective sort of rebound clips. It requires a firm and broad seating for the spring on the perches, a positive method of keying

the spring against endwise movement in relation to the spring perch, not dependent upon the center bolt and, most important of all, a very firm and positive type of spring clip. Due to the free twisting of the axle in reaction from torque, care must be observed in the lay-out of the brake connections to guard against the possibility of this action affecting brake application adversely. To minimize the shifting of the axle in relation to the brake lay-out the springs should be overslung and dead flat.

Customary U-Bolt Form Unsatisfactory

Concerning spring clips, it is my belief that the usual form of U-bolt is not to be considered for Hotchkiss drive application because of the difficulty of securing a firm seating along the entire curved surface of the clip and because of the difficulty of getting mechanics to tighten the nuts on the two legs of the U evenly. The type with a swaged flat end are but slightly better. I consider the best type of clip one which has a thick, flat plate of drop-forged steel, the same size as the spring perch lying over the top of the spring and four straight bolts tying the top plate to the perch. The bolts must be of large diameter and of heat-treated alloy steel to insure against stretching, and should be provided with nuts at both ends. These nuts should be long to insure a secure grip on the threads and the threads should be cut with the greatest accuracy to insure full and even bearing.

As to the method of keying the spring to the axle in such a manner as to insure against endwise shifting under propulsive strains, one scheme which has proved entirely effective and yet quite simple consists in the extrusion of a conical nib about the center-bolt hole on the top leaf, the top leaf, of course, being the only one having direct connection with the frame. This conical nib is mated into a chamfered depression in the top plate of the clip, which also provides clearance all around for the center bolt. The center bolt is thus relieved of any duty except that of holding the spring together when it is removed from the axle. The bolt can, therefore, be made quite moderate in size, requiring only a small hole through the leaves, thus weakening them hardly at all.

In the compass of these articles it has not been possible to touch upon bus body construction. The body, nevertheless, is a most important part of the bus and exerts an important influence on its performance because of its weight; the high cost of repairs if a poorly constructed body is used; and the comfort of passengers in the ease of ingress and egress.

It has been proved experimentally that a bus with an engine of 25 hp., N. A. C. C. rating, a body weighing 2500 lb., and carrying 25 passengers, and an axle geared for average conditions can be satisfactorily operated at 25 m.p.h. maximum speed. An increase in power permits a slight increase in all of these limits, but radical increases in speed or passenger capacity can be secured only at the sacrifice of one for the other, or at the cost of much higher power and corresponding operating cost.

Any considerable increase in speed or passenger capacity, such as would require the use of a more powerful engine, the adoption of more powerful brakes or lower platform, will have to be warranted by a proved economic advantage to be gained. It must be proved that the superiorities of such a bus will sufficiently add to the volume of traffic carried or to the fares which can be charged to render them capable of earning a higher net profit or net return on the investment.

New Two-Piece Rim Eliminates Bolts, Screws, Hinges and Rivets

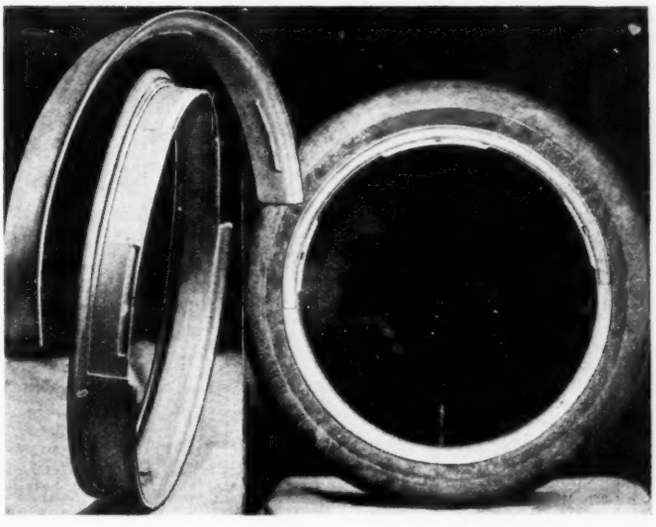
A TWO-PIECE rim has recently been exhibited to manufacturers in Detroit by G. T. Nichols of Gainesville, Texas. One of the pieces is the rim proper and the other is a locking section. The rim differs from those now in general use in that it is not split at any part of the circumference and that it eliminates bolts, screws, hinges and rivets.

The main part has a recess extending half way around the circumference and its full width, into which the locking piece fits. When the locking section is slipped between the outer face of the main rim and the bead of the tire, it causes both beads of the tire to rest on the locking section. This feature is claimed to prevent the locking section from being displaced in turning around very sharp corners.

In the outer edge of the main rim there are a number of recesses or pockets, and on the locking section are a number of lugs which correspond with these pockets. When the locking section is pushed into place between the bead of the tire and the main rim, the lugs on the locking section seat themselves in the pockets on the main rim to hold the locking section in place.

In removing a tire from this rim a screw-driver is inserted in the small notch shown on the rim and pried downward. This raises the lug out of the pocket on the main rim and brings it over the edge of the wall of the main rim. This operation is repeated until the lugs are unseated. This brings the tire forward on the locking section, permitting the locking section to be removed.

One of the claims made for this rim is that it is possible to remove a punctured tire without taking out a bolt or lug, or removing the rim from the wheel. Preliminary arrangements have been made for the manufacture of this rim by an Ohio rim company.



Nichols two-piece rim

A BOOKLET for aircraft pilots has been published recently by the Chief of Air Service, Washington, D. C. This circular, "Airways and Landing Facilities," describes briefly how an airport should be built, how airways and landing facilities should be marked, and gives a complete list of all known landing fields in the United States with a condensed description of their facilities.

Interest in Eight-in-Line Engines Centers in Crankshaft Layout

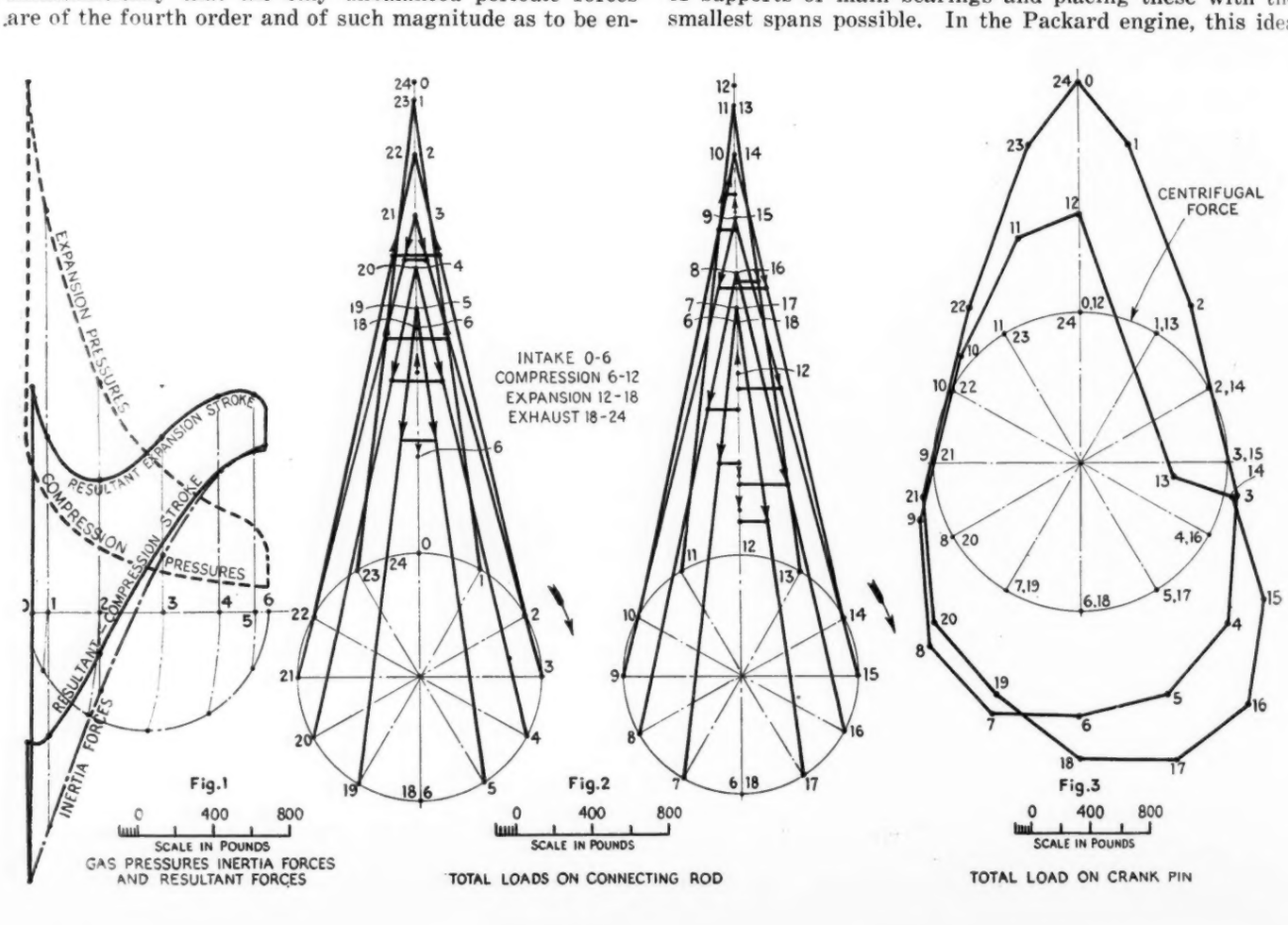
Vibration caused by elastic deformation reduced in new Packard by use of nine main bearings. Analysis shows that theoretical unbalanced condition is less than that which might be created by slight, permissible inaccuracies in manufacturing operations.

EIGHT-IN-LINE crankshafts involve so many interesting factors from an engineering standpoint and there has been so much discussion regarding the timing, balancing and layout of the crankshaft throws on this type engine that the calculations of the Packard company for the single eight will be of interest. Much of the following is quoted directly from the Packard engineering department records of this work.

Vibration may arise from two causes: the first due to unbalanced periodic forces causing vibration of the entire mass of the engine, which is generally transmitted to the entire chassis and varies in intensity when synchronism occurs with the natural vibration of the car itself, or localized synchronism may occur with any part or combination of parts.

In an eight-in-line engine it is possible to demonstrate mathematically that the only unbalanced periodic forces are of the fourth order and of such magnitude as to be entirely negligible. For instance, it may be shown that while with engines of theoretically perfect balance when the pistons are selected, a permissible variation of 2 oz. in weight of individual pistons produces no perceptible vibration, yet this variation in weight may produce an unbalanced force eight times the force of theoretical unbalance of the eight-in-line engine when properly laid out.

The second cause of vibration is the secondary forces set up by elastic deformation of the heavily stressed parts such as the crankshaft, crankcase and the engine mountings. In general, elastic deformation of the crankshaft is caused by the major forces and these may arise either from transverse deflection or torsional deflection or a combination of both. The transverse deflection may be reduced to a minimum without inordinately large proportions of the crankshaft by employing the greatest number of supports or main bearings and placing these with the smallest spans possible. In the Packard engine, this idea



has been carried out to the limit in that the design incorporates the largest number of bearings possible, nine, and spaced as closely as permissible with a durable design for the crank pin. This mounting allows for transverse deflection so small as to cause vibrations of such magnitude that they cannot be detected by the senses. The Packard technical report reads as follows:

Vibrations Successfully Dampened

"Vibrations caused by torsional deflections do not present a difficult problem since a very simple device may be employed to dampen these vibrations. The diameters of the crankshaft, however, are such as to be free from torsional periods of important magnitude. Of course, mathematically, the crankshaft possesses an infinite number of periodic speeds or periods. These are harmonic vibrations of frequencies arranged in infinite series of the multiples of the primary period. When the magnitudes are small enough these vibrations cease to be perceptible to human sense, and hence cease to exist psychologically. With the vibration damper fitted to the Packard engine, vibrations of practical significance do not exist.

"The design of the crankshaft bearings is based on maximum engine speed of 3000 r.p.m. and torque of 2730 lb.-in. Table 1 is a summary of the design data. It will be observed that the maximum and the mean unit pressures do not exceed permissible values. The pressure-velocity (*P-V*) values probably merit discussion. For the crank pin this value is of an exceedingly conservative figure for pressure feed lubrication and indicates that very high durability should be expected. Of the various main bearings it is observed that the *P-V* value for the intermediate, intermediate center and the center main are respectively 5,200, 24,640 and 29,600, the latter two values being apparently very high.

"Considering first the intermediate main bearings, it will be noted that the net effective length is only .905 in. which is a ratio to the diameter of only 38 per cent, although the *P-V* value would indicate that this bearing might be shortened, it would not be advisable to do so in the interest of lubrication. The values for the intermediate center and center main bearings represent maximum permissible values for good durability, the limiting value for main journals for passenger car engines at this speed being about 30,000 with present type of construction and materials. The front and rear main bearings, of course, are made ample to take care of accessory loads and gyroscopic reactions."

In designing the crankshaft bearing, an engine speed of 3000 r.p.m. was selected as a satisfactory basis for the design.

The gas pressures used for the analytical design were found by assuming the engine capable of delivering 85 hp. at 3000 r.p.m. With a mechanical efficiency of .85 and a diagram factor of 95 per cent the indicator card shown in Fig. 1 was computed. The connecting rod loads and the piston side thrust pressures are shown in Fig. 2. Fig. 3 shows in polar diagram form the total loads on the crank pin. Figs. 4, 5 and 6 show the total loads on the various main bearings. Table 1 gives a summary of the bearing design data.

In mathematically demonstrating the balance of the eight-in-line engine, the Packard engineering department

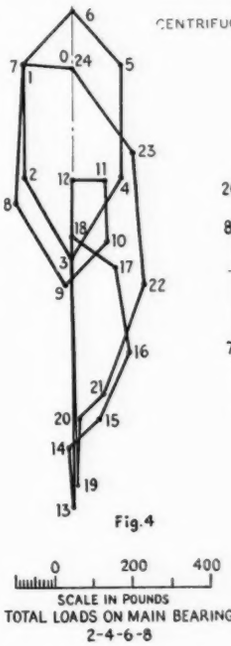
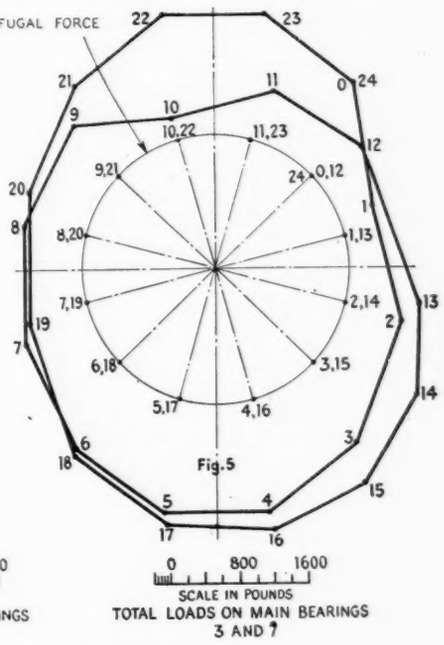


Fig. 4

0 200 400
SCALE IN POUNDS
TOTAL LOADS ON MAIN BEARINGS
2-4-6-8



0 800 1600
SCALE IN POUNDS
TOTAL LOADS ON MAIN BEARINGS
3 AND 7

seeks to show that any unbalanced forces remaining are so small that they are less than would be caused by any slight, permissible manufacturing inaccuracies. That part of the report dealing with engine balance reads as follows:

TABLE 1

Bearing	Crank pin	Front Main (1)	Intermediate Main (2, 4, 6, 8)	Intermediate Center Main (3, 7)	Center Main (5)	Rear Main (9)
1. Journal lengths measured overall on shaft, in.	1 1/2	2 15/16	1 3/16	1 11/16	1 15/16	2 1/2
2. Journal diameters, in. (O. D.)	2 1/8	2 3/8	2 3/8	2 3/8	2 3/8	2 3/8
3. Bearing lengths measured overall on shaft, in.	1 1/2	2 9/16	1 9/64	1 41/64	1 57/64	2 1/2
4. Net effective bearing lengths in (item 4 end chamfers)	1.263	2.475	.905	1.406	1.656	2.183
5. Net effective projected area	2.685	5.81	2.15	3.34	3.93	5.18
Total	2510	2400	880	3205	4400	2400
6. Maximum bear. loads, lbs. Unit	935	413	409	958	1120	463
Total	1540	1900	357	2645	3750	1900
7. Mean bear. loads, lbs. Unit	474	327	166	792	955	367
8. P-V (lbs.-ft./sec.) at 3000 r.p.m.	16000	10200	5200	24600	29600	11400

MISCELLANEOUS CRANKSHAFT DATA

Crank Cheeks:

Width (weakest section) in.
Thickness (net) in.
Thickness (overall) in.

Distance between C. L. to Caps of Crank Pins:

Crank pins 1-2; 7-8 4
2-3; 6-7 .....4½
3-4; 5-6 .....4...
4-5 .....4¾

"Due to the acceleration of the reciprocating and rotating parts of the engine dynamic forces are set up which, when unbalanced, produce periodic displacement or simply vibration of the engine.

"A body of mass M acted on by a force F will have imparted to it an acceleration a and the relation may be expressed by

$$F = Ma \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

if the weight of the body is W pounds, the mass will be

$$M = W g \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

where g = the acceleration due to gravity = 32.2 ft./sec.^{2} therefore, equation (1) becomes

$$F = Wa/g \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

"To find the acceleration of the piston it is necessary to determine the piston travel and velocity in terms of the angular motion of the crankshaft.

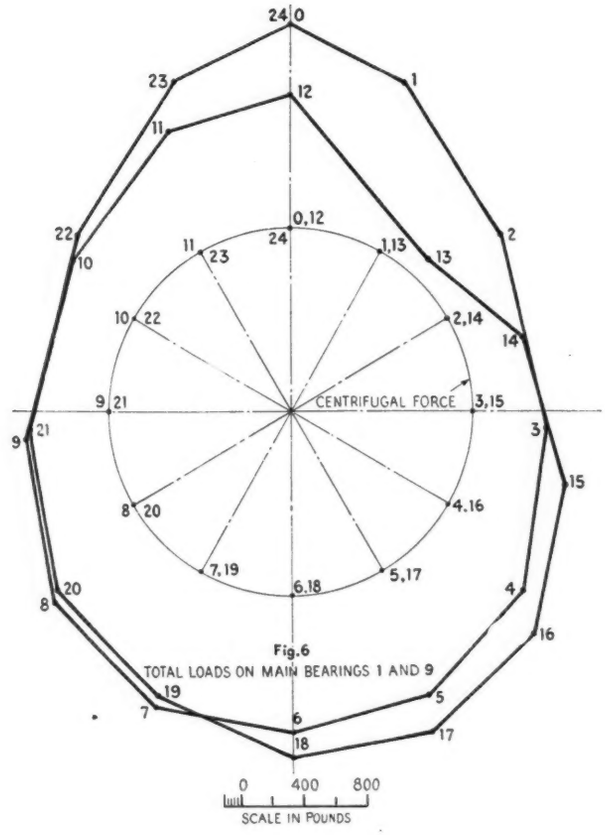


Fig. 6
TOTAL LOADS ON MAIN BEARINGS 1 AND 9

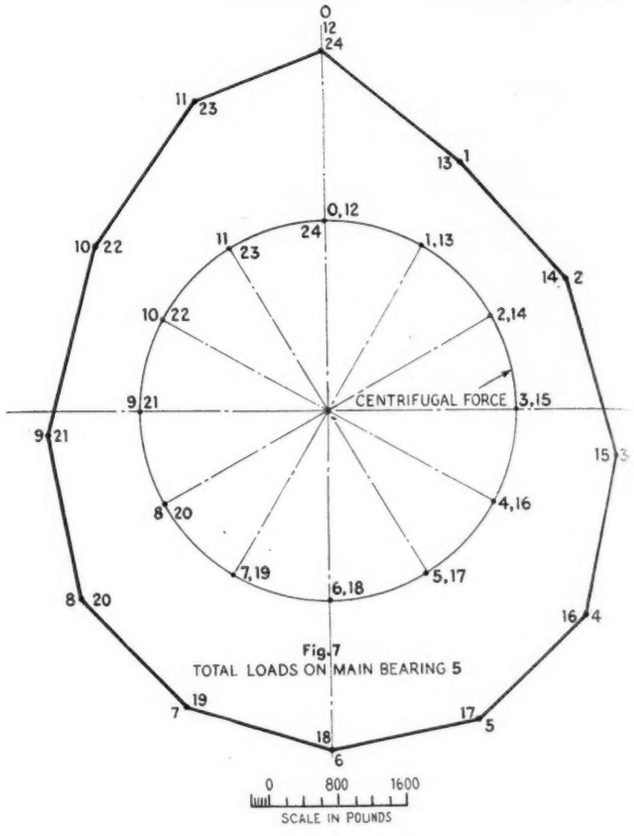


Fig. 7
TOTAL LOADS ON MAIN BEARING 5

Piston Travel, Velocity and Acceleration:

"Piston Travel—Referring to Fig. 9, we have for the piston travel in terms of the crank angle:

$$S = L + R - (R \cos \Theta + L \cos w) \quad (4)$$

$$= L + R - R \cos \Theta - L (1 - n^2 \sin^2 \Theta)^{\frac{1}{2}} \quad (5)$$

$$= L[1 + n - n \cos \Theta - (1 - n^2 \sin^2 \Theta)^{\frac{1}{2}}] \quad (6)$$

$$= L\left[1 + n - n \cos \Theta - \left(1 - \frac{n^2}{2} \sin^2 \Theta - \frac{n^4}{8} \sin^4 \Theta - \frac{n^6}{16} \sin^6 \Theta \ldots\ldots \text{etc.}\right)\right] \quad (7)$$

But

$$\sin^2 \Theta = \frac{1 - \cos 2\Theta}{2} \quad (8)$$

$$\sin^4 \Theta = \frac{3}{8} - \frac{1}{2} \cos 2\Theta + \frac{1}{8} \cos 4\Theta \quad (9)$$

$$\sin^6 \Theta = \frac{5}{16} - \frac{15}{32} \cos 2\Theta + \frac{3}{16} \cos 4\Theta - \frac{1}{32} \cos 6\Theta \quad (10)$$

Substituting in (4) and reducing

$$S = L\,[k_1 - n \cos \Theta - k_2 \cos 2\Theta + k_4 \cos 4\Theta - k_6 \cos 6\Theta] \quad (11)$$

where

$$n = R/L$$
$$k_1 = n + n^2/4 + 3n^4/64 + 5n^6/256$$
$$k_2 = n^2/4 + n^4/16 + 15n^6/512$$
$$k_4 = n^4/64 + 3n^6/256$$
$$k_6 = n^6/512$$

Piston Velocity—

"$V = ds/dt = ds/d\Theta \times d\Theta/dt$ ..... (12)

Assuming the angular velocity $d\Theta\ dt$ to be uniform and equal to ∂

$$V = \partial\, L\, n \sin \Theta + 2k_2 \sin 2\Theta - 4k_4 \sin 4\Theta + 6k_6 \sin 6\Theta \quad (13)$$

Piston Acceleration—

$$a = dv/dt = dv/d\Theta \times d\Theta/dt = dv/d\Theta\ \partial \quad (14)$$

$$a = \partial^2 L\ (n \cos \Theta + 4k_2 \cos 2\Theta - 16k_4 \cos 4\Theta + 36k_6 \cos 6\Theta) \quad (15)$$

The Force of Acceleration for One Cylinder—

"$F = m\ a = W/g\ a$ ..... (16)

Then the force due to the acceleration of the reciprocating parts is:

$$I = (Wg\partial^2 L/g)\ (n \cos \Theta + 4k_2 \cos 2\Theta - 16k_4 \cos 4\Theta + 36k_6 \cos 6\Theta) \quad (17)$$

"Letting $K = W\,\partial^2 L/g$ equation (17) becomes:

$$I = K\ (n \cos \Theta + 4k_2 \cos 2\Theta - 16k_4 \cos 4\Theta + 36k_6 \cos 6\Theta) \quad (18)$$

"The total effect of all the eight cylinders may be found by algebraically adding the inertia forces produced by each cylinder. In order to simplify this operation each order of harmonic forces is treated individually.

"Fig. 8 shows the relative positions of the cranks when the crank of cylinder No. 1 is in the top center position. Proceeding from one to eight, letting Θ_1, Θ_2, Θ_3, Θ_4, Θ_5, Θ_6, Θ_7, Θ_8 denote the crank angle for crank pins 1, 2, 3, 4, 5, 6, 7 and 8, we have:

$$\Theta_1 = \Theta$$
$$\Theta_2 = \Theta_1 \pm 180 = \Theta \pm 180$$
$$\Theta_3 = \Theta_1 + 90 = \Theta + 90$$
$$\Theta_4 = \Theta_1 - 90 = \Theta - 90$$
$$\Theta_5 = \Theta_1 - 90 = \Theta - 90$$
$$\Theta_6 = \Theta_1 + 90 = \Theta + 90$$
$$\Theta_7 = \Theta_1 \pm 180 = \Theta \pm 180$$
$$\Theta_8 = \Theta_1 = \Theta$$

"Then the primary forces for these cylinders are:

$$I^1 = \text{Kn} \begin{bmatrix} +\cos \Theta_1 \\ +\cos \Theta_2 \\ +\cos \Theta_3 \\ +\cos \Theta_4 \\ +\cos \Theta_5 \\ +\cos \Theta_6 \\ +\cos \Theta_7 \\ +\cos \Theta_8 \end{bmatrix} = \text{Kn} \begin{bmatrix} \cos\ \Theta \\ +\cos (\Theta \pm 180) \\ +\cos (\Theta + 90) \\ +\cos (\Theta - 90) \\ +\cos (\Theta - 90) \\ +\cos (\Theta + 90) \\ +\cos (\Theta + 180) \\ +\cos\ \Theta \end{bmatrix} = \text{Kn} \begin{bmatrix} +\cos \Theta \\ -\cos \Theta \\ -\sin \Theta \\ +\sin \Theta \\ +\sin \Theta \\ -\sin \Theta \\ -\cos \Theta \\ +\cos \Theta \end{bmatrix} \quad (19)$$

therefore

$$I^{I} \text{ tot. 8 cyl.} = Kn \begin{bmatrix} 2\cos\Theta - 2\cos\Theta \\ + \\ 2\sin\Theta - 2\sin\Theta \end{bmatrix} = O \ldots (20)$$

"Equation (20) shows that the total primary forces for any crank angle and in every plane are equal to zero or, in other words, are completely balanced.

"The total secondary force for all eight cylinders is:

$$I^{II} - 4Kk_2 \begin{pmatrix} +\cos 2\Theta_1 \\ +\cos 2\Theta_2 \\ +\cos 2\Theta_3 \\ +\cos 2\Theta_4 \\ +\cos 2\Theta_5 \\ +\cos 2\Theta_6 \\ +\cos 2\Theta_7 \\ +\cos 2\Theta_8 \end{pmatrix} = 4Kk_2 \begin{pmatrix} +\cos 2\ \Theta \\ +\cos 2(\Theta \pm 180) \\ +\cos 2(\Theta + 90) \\ +\cos 2(\Theta - 90) \\ +\cos 2(\Theta - 90) \\ +\cos 2(\Theta + 90) \\ +\cos 2(\Theta \pm 180) \\ +\cos 2\ \Theta \end{pmatrix} = 4Kk_2 \begin{pmatrix} +\cos 2\Theta \\ +\cos 2\Theta \\ -\cos 2\Theta \\ -\cos 2\Theta \\ -\cos 2\Theta \\ -\cos 2\Theta \\ +\cos 2\Theta \\ +\cos 2\Theta \end{pmatrix} \ldots (21)$$

Therefore:

$$I^{II} = 4Kk_2 (4\cos 2\Theta - 4\cos 2\Theta) = O \ldots\ldots\ldots\ldots (22)$$

"The fourth order harmonic for all eight cylinders is:

$$I^{IV} = 16Kk_4 \begin{pmatrix} -\cos 4\Theta_1 \\ -\cos 4\Theta_2 \\ -\cos 4\Theta_3 \\ -\cos 4\Theta_4 \\ -\cos 4\Theta_5 \\ -\cos 4\Theta_6 \\ -\cos 4\Theta_7 \\ -\cos 4\Theta_8 \end{pmatrix} = 16Kk_4 \begin{pmatrix} -\cos 4\ \Theta \\ -\cos 4(\Theta \pm 180) \\ -\cos 4(\Theta + 90) \\ -\cos 4(\Theta - 90) \\ -\cos 4(\Theta + 90) \\ -\cos 4(\Theta \pm 180) \\ -\cos 4\ \Theta \end{pmatrix} = 16Kk_4 \begin{pmatrix} -\cos 4\Theta \\ -\cos 4\Theta \\ -\cos 4\Theta \\ -\cos 4\Theta \\ -\cos 4\Theta \\ -\cos 4\Theta \\ -\cos 4\Theta \\ -\cos 4\Theta \end{pmatrix} \ldots (23)$$

Therefore:

$$I^{IV} = -128\ Kk_4 \cos 4\Theta \ldots\ldots\ldots\ldots\ldots\ldots (24)$$

"Equations (23) and (24) show that the fourth order harmonics synchronize in the vertical plane.

"The sixth order harmonic for eight cylinders is:

$$I^{VI} = 36Kk_6 \begin{pmatrix} \cos 6\Theta_1 \\ \cos 6\Theta_2 \\ \cos 6\Theta_3 \\ \cos 6\Theta_4 \\ \cos 6\Theta_5 \\ \cos 6\Theta_6 \\ \cos 6\Theta_7 \\ \cos 6\Theta_8 \end{pmatrix} = 36Kk_6 \begin{pmatrix} \cos 6\ \Theta \\ \cos 6(\Theta \pm 180) \\ \cos 6(\Theta + 90) \\ \cos 6(\Theta - 90) \\ \cos 6(\Theta - 90) \\ \cos 6(\Theta + 90) \\ \cos 6(\Theta \pm 180) \\ \cos 6\ \Theta \end{pmatrix} = 36Kk_6 \begin{pmatrix} \cos 6\Theta \\ \cos 6\Theta \\ -\cos 6\Theta \\ -\cos 6\Theta \\ -\cos 6\Theta \\ -\cos 6\Theta \\ \cos 6\Theta \\ \cos 6\Theta \end{pmatrix} \ldots (25)$$

$$I^{VI} = 36Kk_6 (4\cos 6\Theta - 4\cos 6\Theta) = O \ldots\ldots\ldots\ldots (26)$$

"Equations (20) (22) and (26) show resultant combined forces of the entire eight cylinders are respectively equal to zero, for the primary, secondary and sixth order ratio forces. In other words, these forces are in balance for every position of the crank shaft.

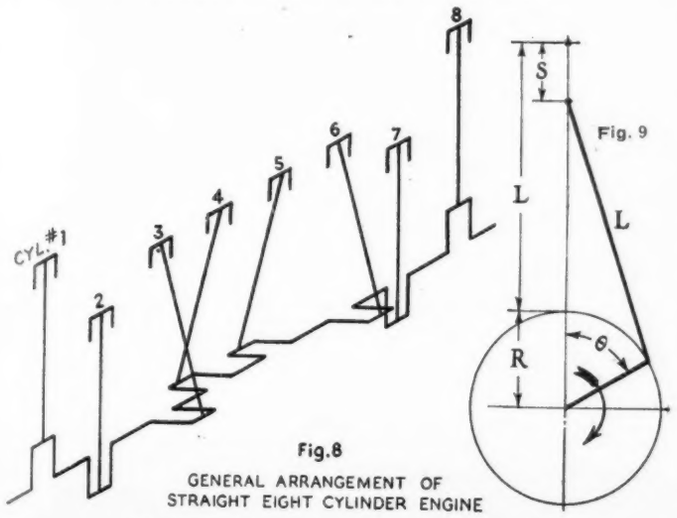


Fig. 9

Fig.8
GENERAL ARRANGEMENT OF STRAIGHT EIGHT CYLINDER ENGINE

Diagram of crank and connecting rod

"Equation (24) shows the synchronism of the fourth order harmonics. These forces act in the plane of the cylinder axis, being alternately positive and negative as the cos of 4 times the crank angle changes from negative to positive sign.

Rocking Couples—

"The existence of rocking couples may be determined by inspection of equations (19) (21) (23) and (25). According to the arrangement of the crank shaft, crank pins 1 and 8 are an equal distance but on opposite sides from the longitudinal center of the engine. Crankpins 2 and 7, crank pins 3 and 6 and crank pins 4 and 5 are respectively symmetrically placed. In order to have equilibrium of moments about any point we must have:

$$\Sigma M = 0$$

Let F represent any force acting at distance "a" from the center of moment, then for equilibrium we must have:

$$\Sigma M = \Sigma(Fa) = 0$$

If two forces $= F$ are acting at distance a, then $\Sigma M_o = Fa - Fa = Fa + F\ (-a)$ whence if $a = -a$ numerically

$$F = F$$

"Therefore, it may be concluded that when two forces of equal magnitude acting at equal distances symmetrically about a point the resultant moment about that point is zero when the forces are acting in the same direction.

"Examining equation (19) we find that the inertia forces for crank pin 4 and crank pin 5 are equal and are acting in the same direction, being equal to $(+\sin\Theta)$. Similarly, for crank pins 3 and 6 the forces are equal to $(-\sin\Theta)$. For crank pins 2 and 7 $(-\cos\Theta)$. For crank pins 1 and 8 $(+\cos\Theta)$ which, according to the theorem just proven, indicates that there are no rocking couples for the primary forces present. By similarly inspecting equations (23) and (25) it can be seen that there are no rocking couples created by the secondary, fourth order or sixth order harmonic forces. By examining the crank shaft shown in Fig. 8 it is also evident that since the same proposition of equilibrium is fulfilled, there are no rocking couples set up by the centrifugal forces.

"From this analysis of the dynamic balance of the straight eight engine, having a crank shaft arrangement as shown in Fig. 8, it will be seen that the only unbalanced forces are those of the fourth order harmonics.

"The importance of this unbalanced condition will depend entirely upon their magnitude which may readily be found by equation (24). The maximum value of this force occurs when the cos 4 $\Theta = 1$, which corresponds to crank angles of 0, 45, 90, 135, 180, 225, 270, 315 and 360. For a stroke of 5 in.; reciprocating weight of 1.78 lbs.; per cylinder; a ratio of connecting rod length to crank radius equal to 2; and speed of 3000 r.p.m., the maximum value of this force amounts to 32 lb. Some idea of the significance of this force may be gained by finding the difference in reciprocating weight necessary to produce it. We find that if the reciprocating weight differed by easily less than 2 oz. this force would be created.

"It is, therefore, apparent that since the theoretical unbalance of this construction is less than the possible unbalance created by manufacturing errors, it becomes entirely negligible, since other types of engines possessing equal inherent balance are unaffected by these errors."

New York Saves Children's Lives by Safe Street Campaigns

Police Bureau reports progress through persistent educational work in spite of increase in number of motor vehicles in operation. Analysis of accident causes enables concentration of effort to lessen hazards. Jay-walking still major trouble.

REASONABLY accurate statistics of vehicular accidents in New York have become available through the Bureau of Public Safety of the Police Department and they disclose some interesting facts as the compilations continue month by month.

Most important of all is the demonstration that a sane and systematic safety campaign among school children can be made to produce rather astonishing results, notwithstanding a somewhat rapid increase in the number of motor vehicles in use. The first six months of 1923 showed a large decrease in fatalities among children under 16 as compared with the same period of 1922, but a very much smaller decrease in the total for all ages.

The following table shows the killed and injured of all ages for the first six months of 1922 and 1923:

	1922		1923	
	Injured	Killed	Injured	Killed
Jan.	1,405	49	1,707	51
Feb.	1,299	62	1,341	47
March	1,830	71	1,881	98
April	2,374	94	2,601	96
May	2,792	95	3,142	81
June	2,729	87	3,136	81
Total	12,429	458	13,808	454

The following table shows the killed and injured sixteen years of age and under for the first half of 1922 and 1923:

	1922		1923	
	Injured	Killed	Injured	Killed
Jan.	367	17	389	19
Feb.	397	28	279	16
March	651	32	592	36
April	1,042	54	1,012	51
May	1,201	58	1,251	38
June	965	53	1,278	40
Total	4,623	242	4,801	200

Second Quarter Figures Show Increase

The increase in accidents for the second quarter as compared with the first was rather startling in each year, especially among school children. It obviously was due to the larger number of motor vehicles in use with the coming of spring weather. Just as many taxicabs are in operation in the first quarter as in the second, but many more privately owned cars go into service in the spring and a good many more commercial vehicles. More children are playing in the streets in warm weather.

Taxicab operators generally are better dodgers than non-professional drivers, but it is highly probable that many accidents are caused by other vehicles trying to dodge taxicabs.

While the roll of killed and injured has been distressingly large in the last six months, the accident rate has declined in the face of a material increase in the number of motor vehicles. It is estimated that 269,945 were in operation in the first half of 1922 and 315,614 the first six months of this year. This would indicate that real progress has been made in the promotion of safety.

No extraordinary features have been connected with the safety campaign in the schools, but it has been persistent and the results have justified the effort. If it were possible to get adults together in the same manner as school children and teach them the same lessons, it undoubtedly would be possible to cut down accidents still further. There are more habitual jay-walkers among grown-ups than among children and jay-walking is a more dangerous pastime than joy riding.

Statistics of Causes Not All Inclusive

Statistics on the causes of accidents gathered by the police are not as reliable as the totals of killed and injured, but they are illuminating. Accident causes are classified only where the information is immediately available by the officer on post who reports the facts. In this classification, for example, if a person struck by a motor vehicle dies later in a hospital, the case is classed merely as an accident. Accidents which hap-

Vehicular Accidents for First Six Months, 1923
All Ages

Cause	First Quarter Killed	First Quarter Injured	Second Quarter Killed	Second Quarter Injured
Crossing street at crossing:				
Vehicles turning corner	..	33	3	61
Vehicles passing street car discharging passengers	..	9	..	20
Persons crossing behind street car into vehicle path	..	32	1	28
View obstructed by umbrella	..	17	..	17
Vehicle starting too quickly on signal	..	2	..	2
Crossing not at crossing	54	1,247	91	2,350
Stealing rides	2	36	4	123
Coasting on sleds and wagons	4	180	..	1
Roller skating	2	24	1	24
Bicycle riding	1	42	3	244
Playing games in street	5	162	21	893
Other causes	39	1,020	40	1,653
Collision of vehicles	8	1,074	15	1,665
Totals	115	3,878	179	7,081

pen when a patrolman is not on the spot and the facts of which are not turned in on an officer's report do not get into the analysis of causes, although all these accidents are reported later and included in the final compilation of those killed and injured. The analysis of accident causes for the first and second quarters of this year, therefore, while it covers less than half the total, is valuable in any serious consideration of means to reduce street mishaps.

Still further analysis of these statistics as they relate to children 16 years old or under gives the data in the table herewith.

While these statistics relate only to the five boroughs of Greater New York and cover much territory where traffic is more congested than elsewhere in the country, they serve to show that a basis can be found for educational effort which will lessen the hazards of the streets. When such figures are supplied by other cities it will be possible to approach the problem of accident prevention in a scientific manner.

Second Quarter Statistics for Vehicular Accidents Persons 16 Years Old and Under

Cause	Killed	Injured
Crossing not at crossing	60	1,241
Crossing at crossing	15	412
Playing in street	22	825
Running off sidewalk into street	11	267
Stealing rides	16	116
Roller skating	..	35
Bicycle riding	2	200
Injured in collision of vehicles	..	149
Jumping on or off cars	..	55
Other causes	4	184
Totals	120	3,484

Fatigue of Metals Research Yields New Results

CERTAIN conclusions previously arrived at in regard to the fatigue of ferrous metals under reversal of stress have been confirmed by more recent experimental work conducted at the University of Illinois Experiment Station during the past year. The conclusions arrived at are that:

1. There exists an endurance limit for wrought ferrous metals, that is, a unit stress below which a metal is capable of withstanding an indefinitely larger number of reversals of stress.
2. The endurance limit for wrought ferrous metals may be determined with a fair degree of accuracy by a short time test in which the rise in temperature under reversed stress is measured.
3. The endurance limit seems to be correlated with the ultimate tensile strength, with the Brinell hardness number, and in a much smaller degree with the yield point and the proportional elastic limit. No correlation was found between the endurance limit and the ductility, the results of the Charpy impact tests of notched bars, or repeated impact tests.

The effect of speed of reversal of stress on the determination of the endurance limits seems to be slightly below a speed of 5000 r.p.m. for tests made on a Farmer rotating beam testing machine. A slight increase in the endurance limit was noted for increased speed of reversal of stress.

Effects of Varying Temperatures

The results of tests of specimens drawn at various temperatures after oil-quenching indicate that for the carbon steel specimens tested neither the ultimate tensile, the endurance limit for flexure, nor the ductility was appreciably affected by draws at a temperature lower than 600 deg. Fahr. For the nickel-steel specimens for draws up to 400 deg. Fahr. the ultimate tensile strength and the endurance limit for flexure diminished slightly while the ductility increased a little. For draws at higher temperatures the changes in values of strength and ductility were more marked, the ultimate tensile strength and endurance limit decreasing, and the ductility increasing. Whatever advantages may be gained by draws below about 600 deg. Fahr., such as relief from internal stress and increased machineability, may be attained with but little, if any, sacrifice of tensile strength or of endurance strength under flexure.

The results of tests of the specimens subjected to severe tensile overstress before being tested in reversed bending indicate that a few applications of stress, well above the proportional elastic limit of the metal, lowered the endurance limit under subsequent reversed stress, the endurance being diminished by 22.9 per cent of its original value for one set of specimens. The effect of polishing the specimens after overstressing has not yet been investigated. Placing the specimens in boiling water did not seem to have any appreciable beneficial effect on the endurance limit.

Formula for Wrought Ferrous Metals

From the test data the following tentative formula is given for wrought ferrous metals as expressing with a fair degree of accuracy the relation between the endurance limit for cycles of completely reversed stress and the endurance limit for cycles of stress not involving complete reversal:

$$S_r = S_{-1}\left(\frac{r+3}{2}\right)$$

in which r is the algebraic ratio of minimum stress to maximum stress during a cycle of stress (for completely reversed stress, $r = -1.0$), S_r is the endurance limit for ratio r, and S_{-1} the endurance limit for completely reversed stress.

If a specimen or machine part is subjected to cycles of repeated-bending stress higher than the proportional elastic limit of the metal, the tests indicate that there may result a failure by excessive distortion of the specimen or the machine part. The endurance limit under repeated-bending stress should, then, never be considered as higher than the proportional elastic limit of the metal.

The recent series of tests were all made on wrought ferrous metals, free from flaws and large inclusions as shown by micrographs, and tested under continuous series of cycles of stress. Tests in reversed bending, combined reversed bending and steady tension, and reversed torsion are included. All specimens were turned with their longitudinal axis in the direction of rolling of the steel.

The information gained from these specimens may not be true for steel with serious flaws or large inclusions, nor should such conclusions be extended to cast steel, cast iron or non-ferrous metal.

The results of these experiments are reported in Bulletin No. 136 of the Station. Previous work on the same subject was recorded in Bulletin No. 124.

Car and Tire Manufacturers Have Profited by Giving Public Square Deal

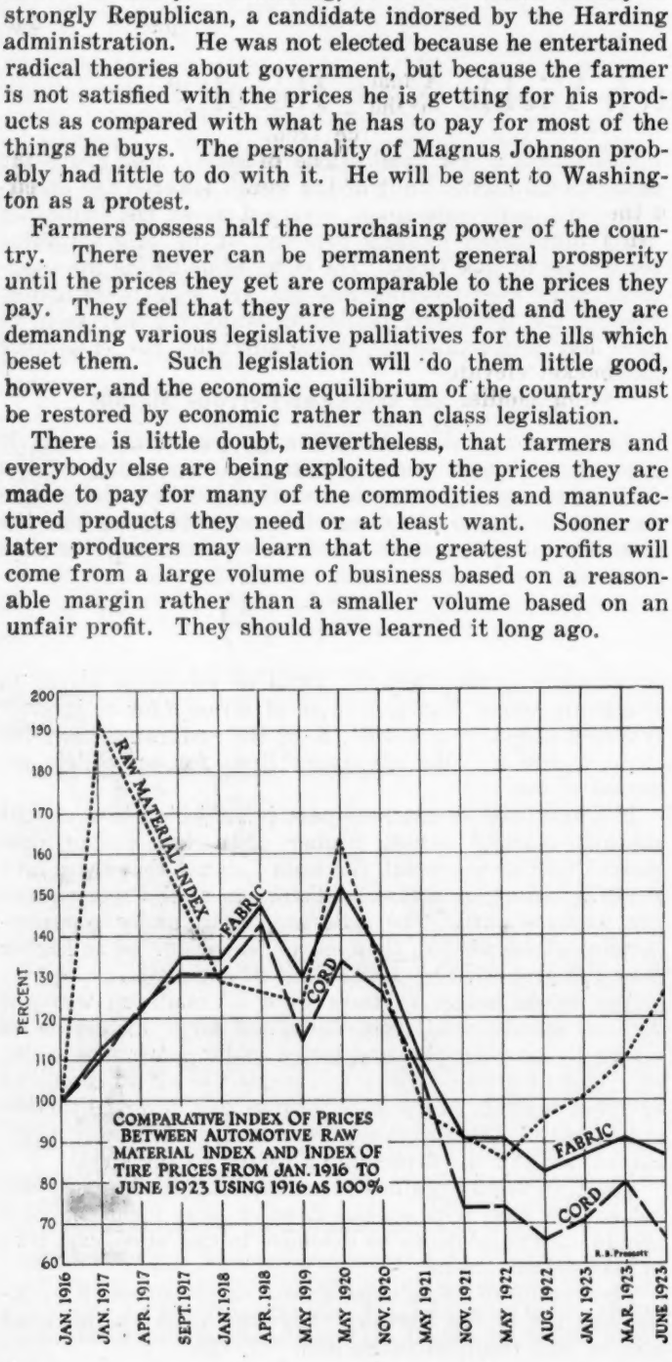
Chances to gouge buyers have been plentiful but low prices ruled and brought volume sales. Rapid recovery after slump of 1920 due to quick absorption of losses and fair play.

AT first glance there may appear to be no possible relation between the election of Magnus Johnson as United States Senator from Minnesota and the automotive industry, but there is a connection.

This Swedish-American farmer, classed as a radical, had no difficulty in defeating, in a State which usually is strongly Republican, a candidate indorsed by the Harding administration. He was not elected because he entertained radical theories about government, but because the farmer is not satisfied with the prices he is getting for his products as compared with what he has to pay for most of the things he buys. The personality of Magnus Johnson probably had little to do with it. He will be sent to Washington as a protest.

Farmers possess half the purchasing power of the country. There never can be permanent general prosperity until the prices they get are comparable to the prices they pay. They feel that they are being exploited and they are demanding various legislative palliatives for the ills which beset them. Such legislation will do them little good, however, and the economic equilibrium of the country must be restored by economic rather than class legislation.

There is little doubt, nevertheless, that farmers and everybody else are being exploited by the prices they are made to pay for many of the commodities and manufactured products they need or at least want. Sooner or later producers may learn that the greatest profits will come from a large volume of business based on a reasonable margin rather than a smaller volume based on an unfair profit. They should have learned it long ago.



This is one lesson which the automotive industry has learned and from which it has profited more than anything else in the last 18 or 20 months. It pocketed its losses and made substantial price reductions soon after the slump of 1920 although it never had profiteered. The result was that business came back more quickly than in almost any other line. When commodity prices began rising many months ago it resisted the temptation to make the purchaser bear all the burden, and was content with a smaller margin per unit, realizing that it would be made up in volume.

High Prices Breed Discontent

As a consequence the farmer feels no animosity toward the automotive industry. He wants motor vehicles just as soon as he can get them. He is thoroughly sold on the idea of individual transportation for he knows he can buy it at a reasonable price. If other industries had followed the same course there would not be so many Magnus Johnsons going to Congress and we would not hear so much about the spread of radicalism. Discontent, especially about prices, is the best fuel ever discovered for radicalism.

Speedy recovery of the industry after the depression of 1920 was hailed as "dramatic," but it was based on fair prices. Everybody concerned absorbed enormous losses. This was especially true of the large companies in the tire business. They suffered severely but they bore it manfully.

The tire industry is beset by numerous merchandising evils but, to its everlasting credit, it has not profiteered even in the face of heavy losses for which it was not directly responsible.

There are many things the motorist can get along without but tires are not included in that category. If his car is to run he must have tires. The average man owning an automobile is not going to lay up his car because tires are expensive, provided he can find the money to buy them. Tire makers, therefore, could easily have made their prices higher and got away with it after the stocks they had on hand in the middle of 1920 had been liquidated—but they didn't do it.

Automobile manufacturers kept their prices down and profited thereby. Tire producers kept theirs down, too, and thus helped mightily to make the motor vehicle more popular in the midst of a "buyers' strike." They probably gained a greater volume of business by this procedure but they might have made larger profits had they made increases, because most of this profit comes from replacement rather than original equipment business and the owners of cars in use would have bought tires no matter what they cost.

Constructive work is being done in pointing out the evils in the tire industry, but it is easier to criticise than to praise and a good many persons seem to have overlooked the real service done the industry by the tire makers.

The tire industry has given the public and motor vehicle

producers a square deal throughout the difficult period of readjustment. Raw rubber and cotton prices began to advance rapidly in the summer of 1922 but tire prices were not advanced until the beginning of 1923. This meant that manufacturers were giving the public the benefit of raw materials purchased at a lower price. This was done in the face of heavy losses suffered only a short time before when material prices fell precipitously after they had made commitments for huge stocks bought at the peak.

Relatively small increases were made early this year when stocks of low priced materials were depleted. Later on, as the raw material markets rose still higher, another small increase became necessary. Soon thereafter material prices eased off and prices to the consumer were lowered, notwithstanding the fact the manufacturers had on hand considerable quantities of higher priced rubber and cotton purchased late in 1922 and in the early months of 1923.

These facts should carry much weight in any discussion of the tire industry.

The biggest fact of all, however, is that all branches of the automotive industry have kept their prices down to a fair level and have not added fuel to the flame of discontent.

New Molding Machines Ram Flasks of Any Size

A LINE of molding machines particularly applicable to automotive foundry work where difficult patterns are employed is being supplied by the Beardsley-Piper Co., Chicago. The machines operate on the same principle as that which is employed by molders when they throw handfuls of packed sand into the deep partings or pockets of intricate patterns. The Beardsley-Piper sandslinger, in utilizing this principle, throws 750 to 1800 handfuls of sand per minute.

It is estimated that an average of 50 per cent of the labor of molding lies in the ramming. The sandslinger is designed to duplicate this process, and with the slinging principle, it is claimed, will effectively ram flasks of any size. The sandslingers are built in the following types: Stationary, tractor, portable and locomotive. The stationary type of sandslinger riddles and rams sand at the rate of 5 to 10 cu. ft. per minute. It is used in foundries having conveyors or other means of supplying sand. This type of machine is found in Fig. 2.

The tractor type of sandslinger, shown in Fig. 1, which is particularly adapted to floor molding of cylinders, large transmission cases or similar castings, takes the sand from the floor, riddles and rams it at the rate of 5 to 10 cu. ft. per minute. It is used in foundries having bays 25 to 50 ft. wide and 150 to 200 ft. long. This machine is adapted to ramming molds containing from 2 to 50 cu. ft. of sand.

The portable type sandslinger, which is adapted to the molding of smaller rims of any size patterns riddles and rams sand at the rate of 7 to 10 cu. ft. per minute. This machine is intended for jobbing foundries, as it is flexible in application and will ram any size mold. It can be placed anywhere on the floor and moved to a new location with a crane.

All of the type of machines, insofar as ramming is concerned, operate on the same principle. The sand is thrown by centrifugal force from a paddle in the impelling or ramming head. The desired density of the sand at any part of the mold is controlled by the speed of the paddle.

In the tractor type machine the sandslinger travels into the sand heap under its own power, collecting the sand from the floor by means of a right and left-hand sand-cutting screw conveyor, which conveys the sand to the center of the machine where it is elevated by means of a bucket elevator and deposited on the screen of an oscillating riddle. This riddle is so constructed that scrap, gaggers, cores, etc., which are in the sand remain on top of the screen and work to the front end, where they drop through a chute into a scrap box, which is mounted on the main arm. The riddled sand is conveyed by the oscillating riddle into a hopper mounted on the impeller arm above a belt that conveys the sand into the impelling head, which discharges the sand with centrifugal force into the mold at the rate of 10 cu. ft. of rammed sand per minute.

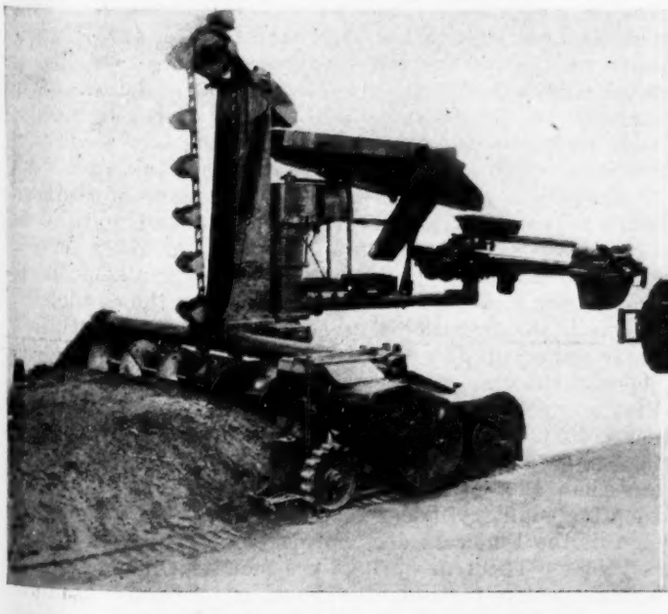


Fig. 1—Beardsley-Piper tractor type sandslinger

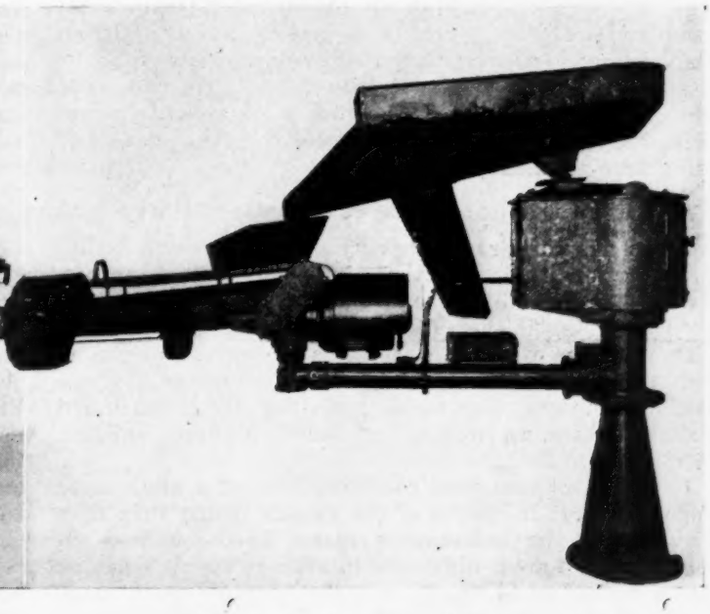


Fig. 2—Stationary sandslinger

National Speedway Favored for Next French Grand Prix

Recent race was run on worst roads ever used in long-distance classic. Four cars put out of commission by flying stones. Fiat entries, using superchargers, were fastest in race. Winning Sunbeam six resembled last year's Fiat but developed more power.

ALTHOUGH the recent French Grand Prix race was won by a Sunbeam car equipped with a six-cylinder engine, the highest speed was made by the eight-in-line Fiat chassis, which (except for the engine, which last year had six cylinders) was similar in most respects to the winning Fiat chassis used last year. In view of the excellent showing made by eight-in-line engines in all of this year's races, including those at Indianapolis and Kansas City, it appears likely that cars with eight-in-line engines will be prominent in the important foreign racing events next year.

Much interest will also attach to the meeting which is scheduled to take place on the Monza track in September when the Fiats will meet the Miller cars which were so successful at Indianapolis this year. Unlike the Miller jobs, the Fiats are equipped with superchargers.

All of the cars except the Voisins entered in the Grand Prix employed anti-friction bearings at all points on the crankshaft, including big ends. Most of these were of the straight roller type, some of them being mounted to bear direct on the shaft and used without cages. The Mercedes cars used at Indianapolis had straight roller bearings in the rods, but these were fitted in cages and each roller carried a minute pinion at each end which meshed with external and internal gears cut respectively in the inner and outer cage rings and apparently designed to keep the rollers exactly parallel with the shaft. Miller has thus far adhered to the use of plain rod and crankshaft bearings operating under high oil pressure. It will be interesting to observe whether he goes to an anti-friction bearing construction or uses a supercharger next year.

All cars entered in the French Grand Prix had front wheel brakes and there appears to be no ground for anticipating any change in this regard in the design of future racing cars.

Road Conditions Played Important Part

Two makes of French cars were equipped with bodies having a longitudinal section similar to that of an airplane wing. One of these, a Bugatti, finished third and one, a Voisin, finished fifth, but there appears to have been nothing to indicate that this radical departure in body construction gave these cars any advantage over the more conventional type of body used by other French and Italian makers, as well as by American firms building racing cars.

It is evident that road conditions played a much more important part in results of the French Grand Prix than they did in the Indianapolis race. This doubtless accounts for the great difference in average speeds made by the winners: 92.44 m.p.h. was the average speed made by the H. C. S. Special at Indianapolis, while the winning Grand Prix Sunbeam made only 75.4 m.p.h. average.

This year's Grand Prix was the finest piece of organization the French club has ever shown, but it was marked by the worst roads ever offered for a long-distance speed test. As a consequence, there has been given a decided impetus to the movement in favor of a national speedway.

Four cars are known to have been definitely put out of commission by flying stones: Bordino's Fiat with a stone through the supercharger; Salamano on Fiat and Morel on Voisin with gasoline tanks punctured; René Thomas with gasoline line broken. Several of the drivers, including Giaccone, Duray and Guyot, suffered cuts around the head from flying stones.

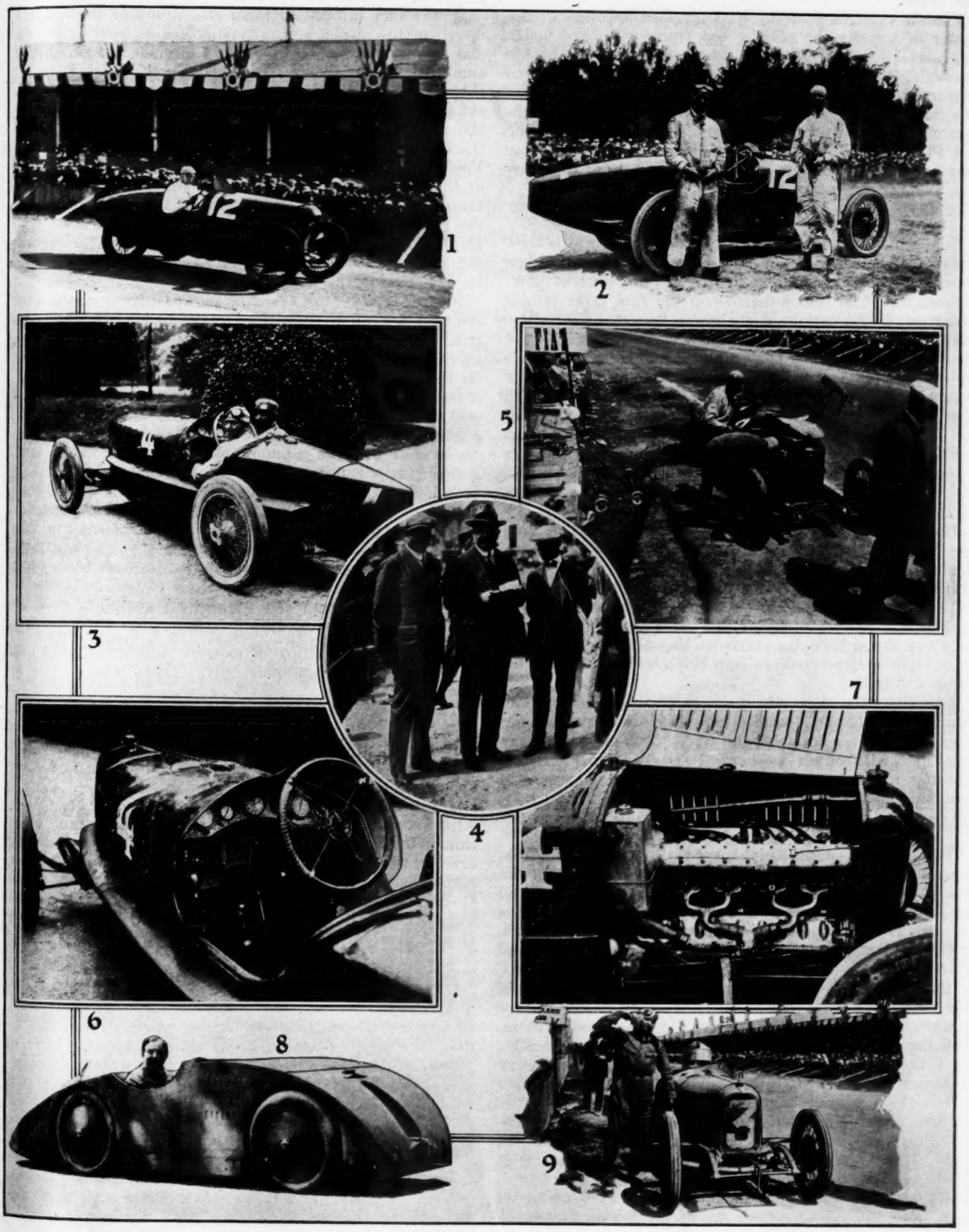
Fiat Fastest in Field

Although a failure for Fiat so far as the final result was concerned, the race proved that these cars were the fastest of the field. The lap records and maximum speed previously credited to Voisin should be credited to the Fiat driven by Bordino. Giaccone's No. 9 Fiat went out with a broken valve, but the two others were victims of the state of the road.

The Fiat supercharger, used for the first time this year, appeared to be a complete success. The blower is contained in an aluminum housing at the front of the engine, with the radiator mounted on it, and is driven direct off the crankshaft, thus always being in operation. The compressed air is carried to the carbureter through a passageway cast in the basechamber, with an automatic valve on the line to relieve excess pressure. A line is taken from the main air passage to a double pump mounted on the instrument board and driven by flexible cable from the exhaust camshaft, to maintain a constant pressure on the carbureter. The gasoline tank, in the tail of the car, is not under pressure. To allow of starting, there is hand operation of the pump, and to provide against a possible breakage of the pump or of its drive a big hand pump is provided to allow the mechanician to keep up the necessary gasoline pressure on the carbureter.

This is the first time a supercharger has been used in a really important race in Europe. The only other firm employing a device of this nature is Mercedes. While the Fiat engineers decline to make any statement, it is believed that their device adds 20 per cent to the power of the engine. The maximum power is believed to be not less than 120, probably at about 5400 r.p.m. Although adopting eight cylinders in place of six, the general design of the Fiat cars does not differ greatly from that of last year. The rear springs are mounted diagonally and brought entirely inside the housing to reduce head resistance. The frame is a one-piece pressing, without

Some Interesting Features of the Grand Prix Race



1 and 2—Segrave and the winning Sunbeam. 3—Bordino on Fiat. Frame members are below rear axle and diagonal semi-elliptic springs are inside body. 4—Fornaca, Cavalli and Cappa, the engineers responsible for the Fiat racing cars. 5—Giaccone of the Fiat team working on his engine. A broken valve put him out of the race. 6—Instrument board and steering wheel of the new Fiat straight eight racer. 7—Straight eight Fiat with supercharger. 8—Bugatti 122-in. racing car with wheel recessed in the body. 9—Guyot, Rolland-Pilain at pits

rivets or bolts. On a perfect road maximum speed is 125 m.p.h.

Chassis changes made by Fiat included lowering of the center of gravity, by placing the frame members under the rear axle, and putting the rear springs entirely inside the body. The frame members are swept in at the rear to conform to the body contour and the semi-elliptic springs are mounted diagonally. This year the servo brake mechanism is of the hydraulic type similar to that used on the big Fiat touring models. The cylinders and pistons for creating the hydraulic pressure are in the base of the gearbox and use the gearbox oil.

Sunbeam Team All Finished

Sunbeam, the winner, and the only firm to finish with a full team, met with conspicuous success with the new six-cylinder racing engines designed by Vincent Bertarione, until last year a member of the Fiat experimental department. Bertarione made only a few changes on last year's Fiat design. Instead of vertical shaft drive for the camshafts he employed spur pinions, and he had counterweights in place of circular webs for the eight bearing crankshaft. Roller bearings for crankshaft, rods and camshaft, mounted direct on the shafts without cages, of the same type as the Fiats, were used. A single Solex carbureter fed the six cylinders. The Sunbeam engineers claim that 108 hp. were obtained from the engines, whereas the highest ever claimed by Fiat last year was 95 hp.

Begun very late and starting in the race without having been round the course in practice, there was some doubt about the ability of the 12-cylinder 122-in. Delage. During the seven laps it was running it gave a very good impression and appears to be a complete success.

Goux having broken up his cuff valve engine in practice, only two Rolland-Pilains started. Hemery went out early with valve spring breakage, and Guyot followed after covering 400 miles.

The Bugattis were green, the only engine completely run in being that on Vizcaya's car, which went out through an accident five miles from the start. Two other Bugattis went out with minor mechanical trouble, but Friedrich, nursing his car at the beginning, showed speed at the end and finished third 25 min. behind the winner.

Unique Body Construction

The Voisins, with Knight type sleeve valve engines, were never sensational from a speed standpoint. On the bench tests these engines had never given more than 80 hp., which placed them at a serious disadvantage with the others, with maximum power varying from 95 to 120. They used magnesium piston with detachable cast iron skirts.

Bugatti employed an airplane wing section as the model for the outline of all four of his cars. Both front and rear wheels are recessed in the body, the track being 40 in. and the wheelbase 79 in. Front and rear ends are alike, with the exception of an opening in the former to allow a current of air to reach the radiator. Total width of the car is 47 in., overall length 149 in. and height 31 in. The undersurface is perfectly flat and gives only just sufficient clearance to prevent touching when running on the rim. To get the center of gravity low, special wheels with 28 x 4 in. straight side tires are employed.

Bugatti raced with eight-in-line engines of 60 by 88 mm. bore and stroke. They are of the three-valve single camshaft type designed by Bugatti for aviation service during the war and have a crankshaft carried in three ball bearings. The connecting rods are equipped with roller bearings. The change speed mechanism is in the rear axle and provides three ratios ahead and reverse. Roller bearings manufactured in the Bugatti factory are employed in the rear axle.

It was very difficult to form an opinion of the relative merits of the airplane wing type bodies as used by Voisin and Bugatti, and the normal type, circular section bodies employed by the others. Theoretically the Bugattis were better than the Voisins, for the former minimized the resistance of all four wheels, whereas the Voisins had only the rear wheels recessed in the body. With a medium track front and rear, the Bugattis held the road well; the Voisins, with a broad track in front and a 30-in. track at the rear, did not appear to be quite so satisfactory in this respect, and they did not have sufficient weight on the rear. One of the possible disadvantages of this type of body is the danger should a tread come off at speed, for with the small clearance the band could barely escape by demolishing the housing.

Bugatti claims that his cars showed higher speed with their streamlining rig than in chassis form. Altough aviation practice was incorporated in the Voisin construction, they were heavier than the Fiats and the Sunbeams built on normal lines.

Despite high engine speed and compression ratios of 7 to 1, there was an absence of magneto and plug trouble. Fiat, Sunbeam and Bugatti used the Bosch magneto. In the case of Fiat the magneto was a new type, hand made, and not yet in full production, with double make and break. It is claimed that this magneto has been run successfully at 9000 r.p.m., each make and break, of course, operating at half this speed. There was no battery ignition on this year's cars. Delage, Rolland-Pilain and Voisin had Scintilla magneto. K. L. G. plugs were used by all but the Bugattis.

Winner Used Straight Gasoline

Straight gasoline was used on the winning Sunbeam; Fiat employed a mixture of gasoline and benzol, and Rolland-Pilain ran on gasoline only. There was no use of alcohol mixtures.

The Fiats will race next September on the Monza track, where they will have to meet the three Miller cars driven by Murphy, Alzaga and Zborowski. Sunbeam is a doubtful starter in this race, but Bugatti, Mercedes and Benz appear certain contestants.

The winning cars used Michelin cord clincher bead tires, with six duralum safety lugs. It is claimed that these cannot be pulled off the rim if run deflated, and that they are lighter than straight side rims. The winner went right through without a tire change and, on the whole, the number of stops for tires was very slight. To get the weight down, Bugatti used 28 x 4 in. wheels fitted with Dunlop straight side cord tires.

A NEW smooth mohair for use as interior trim on closed cars has been placed on the market recently. This class of mohair is described as very beautiful in design, rich in coloring and soft and pleasant to the touch. Colors are said to be fast, and the cloth extremely durable. The goods are soft and pliable and are said to be easily put in place without danger of tearing. Smooth mohairs are said to be somewhat less expensive than the rough grades and are easily cleaned by wiping off. Head linings are made of lighter weight goods to match the heavier grades used on seats and seat backs.

Some of the smooth mohairs are made with pure mohair filling and some with a filling of half mohair and half lustre wool. They are furnished in a variety of designs and colors including stripes, armure designs and plain antique satin effect. They are manufactured by the Goodall Worsted Co. and distributed by Lesher, Whitman & Co., Inc.

Recent German Carbureter Designs Stress Use of Cheaper Fuels

Rising costs making economy imperative; progress in engine development and demand for special equipment for motorcycles largely responsible for new products. Heavy oils handled by double instrument with two float chambers. Tests successful.

By Benno R. Dierfeld

CONSIDERABLE progress in carbureter design has been made in Germany recently. This may be traced back to the high cost of fuel, making economy in its use imperative; to progress in engine design permitting of the use of heavy fuels, and to the demand for special carbureters for motorcycles.

The most important group of these new carbureters is that designed for cheaper fuels, as it has made possible the use of kerosene, tar oil, etc., in the standard truck and tractor engines. An intermediate step to the adoption of the heavy oil carbureters consists in the use of a device known as the Thermokrat heavy oil igniter, which is manufactured by a company in Mannheim. It consists of an auxiliary chamber of cast iron, one of which is screwed into the spark plug hole of each cylinder. This auxiliary chamber communicates at its lower end with the combustion chamber and carries the spark plug in an inclined position near the top. At the very top there is a small automatic inlet valve, and from this a pipe extends to a small auxiliary carbureter near the driver's seat. The suitably adjusted main carbureter operates on kerosene, phenol oil, etc., while the auxiliary carbureter is supplied with some more volatile fuel, such as gasoline or benzol.

During the suction stroke the engine draws a mixture of heavy fuel and air through the main carbureter into the combustion chamber, and a mixture of gasoline and air through the auxiliary carbureter into the auxiliary chamber. Some of this more inflammable mixture penetrates into the combustion chamber and there mixes with the less inflammable heavy fuel mixture. The spark occurring in the auxiliary chamber, the light mixture ignites first, and the burning gases shoot through the communicating passage into the combustion chamber, producing turbulence and increasing the compression of the heavy oil mixture there, and at the same time igniting them. In this way, it is claimed, the problem of dealing with the knocking tendency of heavy fuels has been solved, as the desired compression pressure is created only an instant before the crank reaches the dead center position, after all danger of pre-ignition is past. The time of ignition can be regulated at will independently of the crank motion.

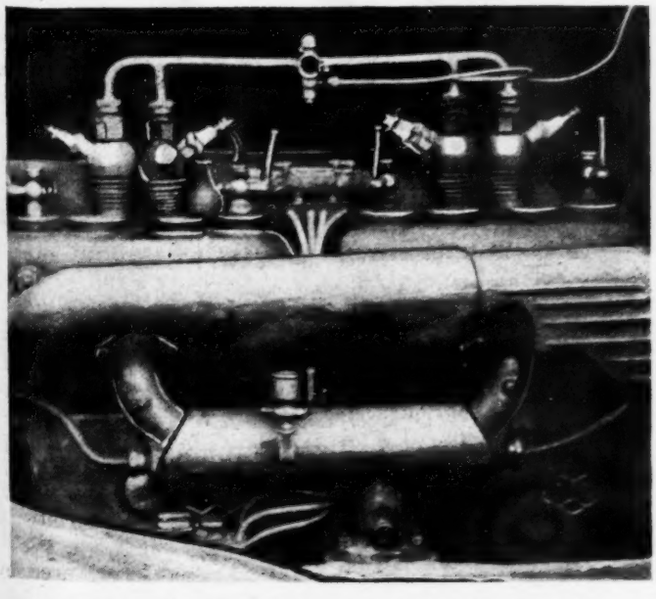


Fig. 1—Thermokrat heavy fuel igniter fitted to engine

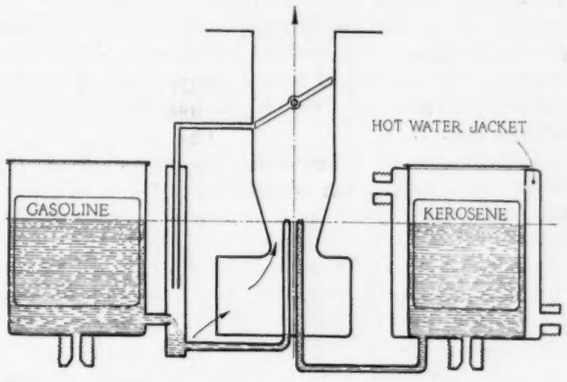


Fig. 2—Diagram of the German Zenith Carbureter Co.'s kerosene carbureter

The Berlin Omnibus Co. has this device in regular use on a lot of its vehicles. According to a letter of the company, ten of the buses have covered more than 12,000 miles each and one more than 19,000 miles, without any indication of deleterious influences on the regularity of service and the life of the engines. The power of the engines has not decreased. It should be pointed out in this connection that the Berlin bus service subjects a heavy fuel engine to a most severe test, as the buses stop every 1000 ft. and the engine is then allowed to idle for a considerable period. The fuels used were kerosene and gasoline, the former being fed to the main carbureter and the latter to the auxiliary carbureter. The total fuel consumption, consisting of 85 per cent kerosene and 15 per cent gasoline, was about 10 per cent in excess, on a weight basis, of the consumption of gasoline or benzol, and the saving in fuel is said to be as high as 70 per cent.

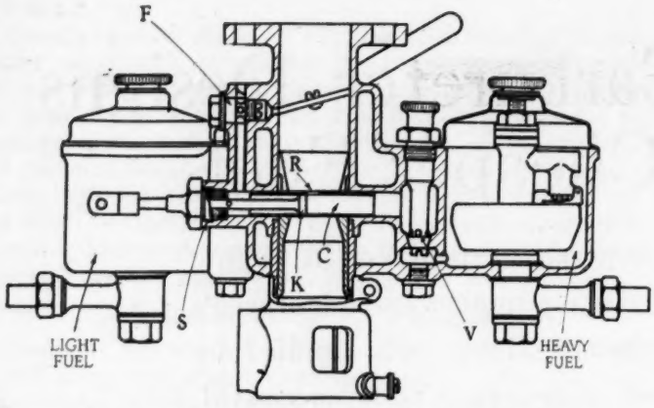


Fig. 3—Part sectional view of Graetzin heavy fuel carbureter

All of the heavy oil carbureters proper now used in Germany are double instruments with two float chambers. A good example of a standard carbureter which has been redesigned for the use of heavy fuel is that of the German Zenith Carbureter Co., which is diagrammatically represented in Fig. 2.

In this device, in addition to the float chamber holding gasoline and supplying a starting and a compensating nozzle, there is provided a separate float chamber for kerosene, which feeds to a special nozzle. The compensating nozzle, which is fed only with gasoline, operates only during transition periods and when the engine is idling. The consumption of gasoline depends upon the size of the compensating nozzle, which functions in the same way as in the standard Zenith carbureter. Of course, the heavy fuel has to be preheated, the preheating temperature for kerosene being 30 deg. C. (86 deg. Fahr.), and this is accomplished by surrounding the kerosene pipe, or, preferably, the kerosene float chamber, by a hot water jacket, as shown in Fig. 2. Data with respect to the consumption of this new carbureter are not yet available.

Graetzin Carbureter Proved Efficient

Fig. 3 is a sectional view of the Graetzin heavy oil carbureter that has proved its efficiency in long tests. This device has been designed mainly with a view to securing smooth operation at low speeds, which is a weak point with most engines operating on heavy fuels, in which sudden opening or closing of the throttle often causes failure of the ignition. For operation under such conditions the Graetzin uses light fuel, or a mixture of light and heavy fuel in the proportion of 70 : 30, which is delivered through the left hand float chamber, while the right hand float chamber delivers heavy oil. The nozzle body *V* carries at its lower end the main nozzle, and at its upper end the compensating nozzle. The space surrounding this nozzle body is called the auxiliary mixing chamber, in which a coarse atomization of the fuel is effected. Further intermixture of the air and fuel particles takes place in the passage leading from the auxiliary mixing chamber to the spraying orifice *R*, which passage is surrounded by a hot water jacket. The heat thus imparted to the mixture causes the more volatile elements of the fuel to vaporize in the tube *C* and the fuel mixture to be ejected from the orifice *R* under pressure. To guard against recondensation of the fuel as it passes from a region of higher to one of lower pressure, through the orifice *R*, the main air is preheated. The light fuel float chamber communicates with the idling nozzle *F* as well as with the tube *C*.

An interesting feature of this carbureter is the "change-over" device, which consists of a piston *K* whose rod passes through a stuffing box *S* and connects through linkage to an operating device on the dashboard. Piston *K* is located in tube *C* near the spraying orifice *R*. When the engine is to be started the piston is moved to the right, thereby placing the spraying orifice in communication with the light fuel float chamber.

Operation of "Change-Over" Piston

The carbureter is operated with the "change-over" piston in this position only long enough to attain a temperature sufficient for vaporizing the heavy fuel, that is, for 5 to 8 minutes under full load. The "change-over" piston is then moved to the left, to the position it is shown in, in the drawing, for which the spraying orifice *R* communicates with the heavy fuel float chamber. In the event of a sudden closing of the throttle the engine does not stop, because the idling nozzle remains constantly in communication with the light fuel float chamber.

A number of truck and tractor manufacturers have tried the Graetzin heavy fuel carbureters and report satisfactory results. For instance, the Magirus company of Ulm reported in March last a saving of 21,000 marks per 100 km. on the cost of fuel. Another truck firm made a test run with a fully loaded 3-ton truck over a distance of 5.26 miles with a fuel consumption of 3.96 lb. of gas oil and 1.98 lb. of a mixture of one part gas oil and three parts of benzol. Previously 5.2 lb. of pure benzol was required to cover the same distance, and the saving on the fuel amounted to 45 per cent.

Another German heavy fuel carbureter is the Schidlowsky, manufactured by the Schiele-Bruchsaler Industrie Konzern, which is illustrated in sectional views in Fig. 4. It consists essentially of two float chambers, one, *B*, for heavy fuel and the other, *A*, for light fuel, with their respective nozzles, and of the vaporizer proper, *G*. The float chambers and their nozzles are of the same design

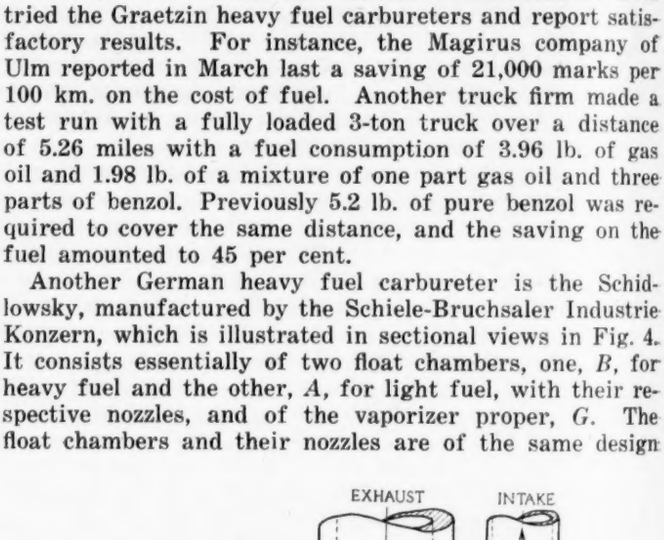


Fig. 4—Schidlowsky heavy fuel carbureter and vaporizer

as in an ordinary gasoline carbureter, and the mixture formed at these nozzles passes through a cylindrical valve operated from the driver's seat. Ports in the wall of this valve place the mixing chamber for one or the other of the fuels in communication with the vaporizer, *G*. This consists of an inner cylinder, *H*, with outer ribs, *I*, forming by means of three flanges, *J*, with the vaporizer case three annular chambers, *K*, *L* and *M*, which communicate with each other through the inclined diametral passages *N* and *O*.

The interior of the cylinder is connected to the exhaust pipe and is consequently strongly heated. The fuel mixture enters the vaporizer at the top, flows through its three sections successively and leaves at the bottom, whence it passes into the inlet pipe, *P*, containing the throttle valve, *Q*, and idling nozzle, *R*. This latter connects directly with the light fuel float chamber, and it is stated that a small amount of fuel is passing this nozzle also when the engine is running on the heavy fuel under full load.

In starting, only light fuel is drawn in, and the mixture flows only through the lower section of the vaporizer. As the valve *C* is turned around further, communication with the heavy oil mixing chamber *F* is established, and in the final position the heavy oil mixture passes through all three sections of the vaporizer to the inlet pipe. Feed of light oil through the main light fuel nozzle *S* then ceases, and only a small amount of the light fuel passes to the engine through the idling nozzle *R*. Near the two float chambers there are nozzles *U* and *V* containing the metering orifices, which are readily interchangeable.

Superchargers Add Problem to Carbureters

The German Postal Department tested this carbureter under rather severe conditions (snow and ice in a hilly region) for a distance of 500 miles. The consumption per 100 km. (62.5 miles) figured out to 35 kg. of gas oil and 10.3 kg. of the German standard fuel tetralin. This carbureter also works well with a fuel consisting of three parts of gas oil and one part of benzol. At the present time 100 mail wagons and omnibuses of the Post Office Department are using this carbureter.

Superchargers have been introduced on automobile engines by the Mercedes company in order to get increased power from an engine of given dimensions. This has introduced a new carbureter problem, for while the pressure at the throat of the carbureter is affected by the supercharger, the pressure in the float chamber remains at atmospheric, and it will be readily seen that if the pressure in the throat equals or exceeds atmospheric then no fuel will issue from the nozzle. Hence the ordinary carbureter cannot be used. At first the expedient was tried of compressing the combustible mixture, rather than pure air, by means of the supercharger by connecting the supercharger between the carbureter and the engine. This involves the disadvantage that the inlet pipe becomes quite long and has a good many changes in cross section, which is detrimental to the production of an homogeneous mixture.

It was found to be best to insert the carbureter between the supercharger and the engine and maintaining the same proportion between the pressure in the throat and the float chamber as obtains in the ordinary carbureter. This can be done by raising the pressure in the float chamber to that existing at the entrance to the throat of the carbureter.

This simple solution of the problem has been offered by the German Zenith Carbureter Co. of Berlin-Halensee. Fig. 5 shows the Zenith carbureter for supercharging engines. The single air inlet *A*, which is fed from the supercharger through a copper tube, communicates with

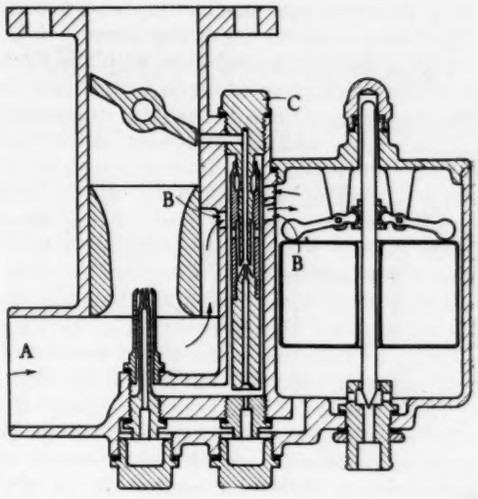


Fig. 5—German Zenith carbureter for engines with supercharger

the top of the float chamber through the passage *BB*, so that the pressures in these two places are in equilibrium. The arrangement of the nozzles is the same as in the regular Zenith carbureter.

Of course, the cover of the float chamber is made air-tight, and the cap over the top of the needle valve also makes an air-tight joint. The passage for the idling mixture also extends through a cap screw, *C*, and the two air holes for the idling mixture are drilled through the float chamber wall directly underneath the cover. Fuel feed is accomplished by pressure, and this evidently must be higher than the pressure at the outlet from the supercharger or compressor.

The continuously increasing use of light motorcycles (mainly converted pedal cycles) and tricycles in Germany has led to the production of new carbureter designs. Obviously these carbureters must be very compact, and the operation of their small and light floats is materially interfered with by the severe vibrations to which they are subjected in use. These vibrations prevent the proper closing of the float valves, so that fuel flows into the float chamber practically continuously, though naturally only at a slow rate. The result is that the fuel level in the float chamber rises beyond the top of the spray nozzle, causing dripping of the carbureter, which continues even after the engine has been shut down, until the level in the float chamber has dropped to a point even with the top of the nozzle.

Floatless Carbureters Coming Into Use

This disadvantage cannot be overcome in float carbureters, but it does not exist in floatless carbureters. Such carbureters are coming into extensive use on light motorcycles and similar vehicles, because, in addition to the advantage mentioned, they are lighter and simpler in design, cheaper to manufacture and easier to install. Indeed, floatless carbureters are particularly suited to these light vehicles, because the differences in fuel pressure are very slight, amounting only to heads of 2 to 4 in., which are negligible compared to the violent shocks received by the carbureter in driving, and in view of the fact that the metering orifices are small and have a strong throttling effect.

Fig. 6 shows a section and an elevation of the Osco floatless carbureter manufactured by Paqué & Ostner of Dresden. The body of the device is in the form of a large T fitting, the horizontal branch *A* of which is connected to the inlet pipe of the engine. Within the vertical branch is arranged the throttle valve *G*, which is operated by

means of a Bowden wire mechanism and a coiled spring. Within the lower part of the body there is a bushing, *C*, which contains the nozzle assembly with the threaded boss *W*, from which connection is made to the fuel tank.

The fuel metering orifice is inside a nozzle screwed into this threaded boss, and is therefore submerged. From the metering orifice the fuel flows through an ell into the rather large diameter standpipe *E*, which is contracted near its top end, the opening there being closed by the small needle valve *F* with a mushroom head *D*. The heavy head presses the needle valve down on its seat and prevents fuel flow from the standpipe when the engine is at rest. The standpipe *E* is surrounded by a flanged hollow cylinder, *B*, which forms a seat for the valve head *D*. Part *B* is screwed into the ell *X* and is adjustable for height. The interior of the hollow cylinder *B* communicates with the atmosphere through four rather large holes, *Y*. The throttle valve *G*, whose lower part surrounds the cylindrical piece *B*, is double acting, as it were, for its operation in one direction results in the obturation not only of the outlet passage *V* but also of the air inlet holes *Z*. The simultaneous variation of the air inlet to and the outlet from the spraying chamber has the effect of keeping the suction in the spraying chamber substantially constant regardless of the demand on the carbureter, and therefore tends to keep the mixture proportion constant. The mode of operation of this carbureter is as follows:

Higher Gas Speed Obtained

In the sectional view the throttle is shown in the starting position. It has uncovered a narrow slit of the outlet *V*, and the suction of the engine piston now creates a partial vacuum in the interior of the carbureter. The air inlet holes *Z* are still closed by the skirt of the throttle valve *G*, which seats on the flange of part *B*. Consequently the vacuum raises the needle valve *DF* and draws in air through the openings *Y*. With the air entering through *Y* mixes fuel that is rising through *E* and is sprayed through the annular space between *D* and *B*. The proportions of these air and fuel passages are such as to produce the fat mixture desirable for starting, and this is rendered more homogeneous, it is claimed, by being passed through the narrow slit *V*.

The idling adjustment is obtained by means of the

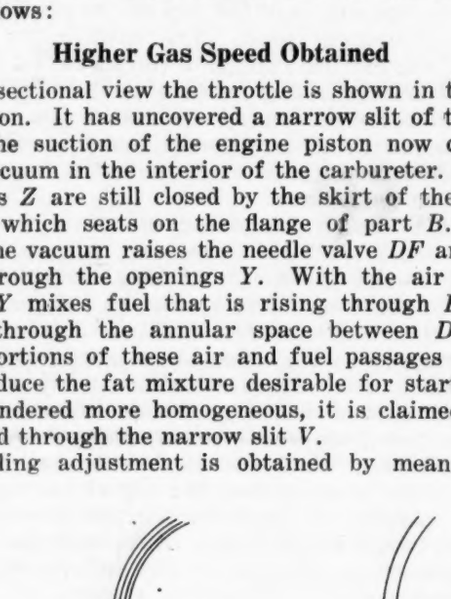


Fig. 6—Osco floatless carbureter for light motorcycles

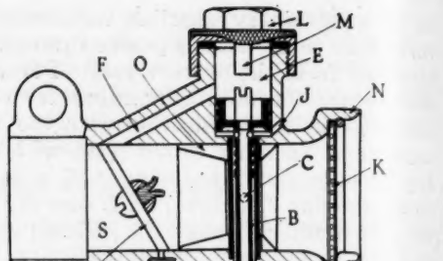


Fig. 7—Pallas floatless carbureter for motorcycles

bushing *C*. While the engine is idling the throttle valve *G* closes the two upper rows of main air holes *Z*, while the lower row is uncovered, although it is shut off from the interior of the carbureter as previously explained. As the throttle is opened a narrow annular passage is formed between its lower edge and the flange on part *B*, through which air entering through the bottom row of main air holes may get to the interior of the carbureter, and at the same time the section of the outlet opening is increased. This results in a higher gas speed, in a more rapid fuel flow through *DF* and in the entrance of additional air through the bottom row of holes, *Z*, which mixes with the fuel mixture at *V*. If the throttle is opened still further the upper rows of air holes *Z* will also be uncovered, and more extra air then enters, in conformity with the increased suction at the needle valve due to the wider opening of the throttle at *V*.

Another floatless design, shown in Fig. 7, is the Pallas carbureter made in Berlin. The fuel enters at *A* and flows to the passage controlled by the conical valve *B*, which is in the form of a hanging tube and shuts off the fuel flow when the engine is at rest. At its upper end the conical valve *B* carries a piston within the cylindrical chamber *E* communicating with the mixing chamber *S* through the passage *F*.

The fuel flow is controlled by the interchangeable calibrated metering orifice *D*. The stop pin *M* within the cap *L* limits the stroke of the piston and of the conical valve *B*. When starting the engine, while the throttle valve is only opened slightly, a partial vacuum is formed in the mixing chamber *S* which is communicated through the passage *F* to the chamber *E*, thereby causing the piston and the conical valve *B* to lift and the fuel passage to be opened. The fuel now fills the annular space surrounding the conical valve *B* up to the orifices *C* as well as the interior of this valve. With increasing engine speed and consequently increased suction, the fuel level within the valve *B* drops, whereby the orifices *H* at its lower squared end are uncovered, and these orifices now serve as an air bleed, admitting air entering at *J* to the fuel passage. This air bleed tends to keep the mixture proportion constant, in accordance with the well-known principle. A strainer *K* is inserted in the main air inlet *N*. The interchangeable throat *O* permits of readily adjusting the carbureter to different engines.

There is an idling nozzle *Q* which discharges a mixture of air and gasoline, flowing to it through passage *P*, against the lower edge of the throttle valve. The same as in the standard carbureter, this starting nozzle ceases to function automatically as the throttle is opened. It can be quickly removed from the outside for the purpose of interchange.

Four Volumes for the Industrial Bookshelf

CONCERNS interested in building up a library for the retail salesmen of their dealer organizations will find Harold Whitehead's "Principles of Salesmanship" a worth while addition.

This volume is a completely revised edition of a work appearing in 1917. It is written primarily as a text book for schools and colleges and includes in an appendix a series of questions and problems and a supplementary reference reading list.

Good salesmen are in such great demand that it is impossible to find them ready made in sufficient numbers; they must be trained from good stock. While constant practice is the only sure road to efficient selling, much ground work can be covered by means of books. As Whitehead says, a man's value as a sales producer will be greater if he is trained to use his analytical and reasoning faculties. A book may present the analytical side and be of great assistance in that manner.

"Principles of Salesmanship" is thoroughly practical and interesting reading. Numerous examples drive home the point, and sales problems are explained with clarity. Ronald Press, New York, is the publisher.

IT is sometimes to be wondered that laymen know so little concerning the properties and dangers of gasoline, a fuel upon which we are all dependent to a large degree. Perhaps curiosity is not aroused as in the case of many other things most common to us. A more widespread knowledge of the properties and dangers of gasoline would be a material aid to reducing the number of accidents which happen yearly.

In a brief manner the essential facts concerning this fuel are presented by Augustus H. Gill in "Automobile Gasoline, Its Dangers and Tests," recently published by J. B. Lippincott Co. Gill offers information to the layman and gives specific tests and their interpretation for the chemist as well.

Methods of manufacture are outlined clearly and principles are laid down for the proper handling of this fuel. A chapter on carbon removers and knock eliminators sets at naught the claims of manufacturers of a good many frauds which have sprung up successively in years past. An appendix contains U. S. Government gasoline specifications and other useful tables in connection with the subject.

SINCE the early part of the World War most of the industrial countries of Europe have been suffering from a scarcity of fuels. Since the Armistice the situation has improved very little on the whole.

During the war itself the fuel shortage was undoubtedly most acute in France, which country had previously imported about one-third of the 60,000,000 tons of coal representing its annual consumption and now saw its most important mines in the hands of the enemy. The Armistice, of course, improved the situation of France in this respect, for by the Treaty of Versailles it secured control of the coal mines in the Saar Basin, with an annual production of 8,000,000 tons, and Germany was further held to make large annual deliveries of coal, coke and other fuels for a long period of years. Yet the fuel shortage is far from relieved, as shown by the fact that, according to the latest reports, more than one-half of all the blast furnaces in France are either damped or completely shut down for lack of fuel.

Other countries had similar experiences, and to cope with the situation the various Governments appointed boards or committees to study the problem and suggest remedial measures. Private institutions also attacked the problem, and as a result there has grown up in recent years an immense literature dealing with the economical use of fuel.

There has just come to hand a copy of a new volume dealing with the efficient use of fuels, from the well-known publishing house of Gauthier-Villars & Cie of Paris—"Economies de Combustibles, Conduite Rationelle des Foyers" (Economical Use of Fuels, the Rational Operation of Furnaces), by Pierre Appell. The book deals chiefly with the industrial uses of coal, as in steam power plants, gas works, gas generators, metallurgical works, etc. Liquid fuels and solid fuels other than coal are covered only in a cursory way. The book deals with the choice of fuels for different purposes, the testing of fuels, and with efficiency tests of complete fuel burning installations.

Particular attention has been given to the regulation of furnaces, the calculation of heat balances and the precautions to be taken in making various measurements in connection with the practical use of fuels. A great deal of tabular material is included and the subject indicated by the title seems to be well covered.

FOR the student who first takes up the subject of motor car engineering there is needed a handbook explaining in simple language and in not too great detail the component parts of the car and their respective functions. Of course, a great many of those who take up this study do not expect to become designers and require only a general knowledge of motor car mechanism.

A book that meets the requirements of this class is "Motor Car Mechanism" by W. E. Dommett, published by Scott, Greenwood & Son of London, and handled in this country by the D. Van Nostrand Co. The volume was originally brought out in 1913 and a second edition with the necessary revisions to bring it up to date has just made its appearance.

The whole gamut of motor car parts, including carbureters and magnetos, is covered, though necessarily in a rather brief form. An appendix contains mathematical tables such as logarithms and conversion tables.

Correction

IN its account of the four-wheel brake session of the Society of Automotive Engineers at the Spring Lake summer meeting, AUTOMOTIVE INDUSTRIES erroneously included the name of C. T. Myers among those who seemed to take the position that the four-wheel braking system is a fundamental improvement and that it has come to stay. Myers subscribed, to the contrary, to the views of H. M. Crane, who emphasized the merits of a properly designed transmission brake as opposed to a four-wheel system. Myers held that it will be a long time before it will be possible to effect satisfactorily the compromise which will be necessary properly to adapt four-wheel brakes.

Public Warehouses Help Reduce Cost of Tire Distribution

Make possible larger proportion of carload shipments and give low overhead expense, it is claimed. Benefits accrue to both manufacturer and dealer. Limited use of facilities in past. Cooperative effort likely to develop more efficient service.

By W. J. Buchanan
Traffic Manager, Griswold & Walker, Inc.

WAREHOUSING, either private or public, is an essential factor in the efficient distribution of tires and is closely interlocked with every other factor in distribution. To what extent economy is served by either class of warehouse can only be determined by careful analysis of the complete operation that lies between production and consumption.

Intelligent use of warehousing will permit the employment of the most economical methods of shipping and eliminate much of the waste of present methods of tire distribution.

It is impossible at this time to present a detailed statement of the cost of private warehouses as compared with the public warehouse, because lack of uniformity in the use of both by the tire industry prevents determination of an accurate average cost of either.

A general survey, however, shows the private warehouse to suffer in comparison with the public warehouse. The operation of a private warehouse creates overhead expense which is constant in good times and in bad times. This expense accrues regardless of the volume of business and can be applied only to the business of one producer. The basic economy of the public warehouse is the distribution not only of overhead expense, but operating expense as well, over a large number of accounts in exact proportion to the volume of business handled for each.

The use of the public warehouse gives the producer complete control of his products, for the tires are delivered to the dealer according to his requirements. This places all dealers on an equal basis and stabilizes prices, for the temptation to move excess stock at bargain prices is removed.

When financial necessity arises negotiable warehouse receipts may be secured and used as collateral for loans for the purpose of financing manufacturing operations or for the purchase of raw materials.

The flexibility of space supply in the public warehouse solves, in a most economical manner, the problem of seasonal accumulation of stock. The negotiable warehouse receipt likewise solves the problem of financing continuous operation during periods of stock accumulation. Whatever reason there may have been in the past for the unwise practice of giving dealers extended datings as an inducement to purchase tires beyond their requirements is therefore removed and the bugaboo of bargain prices goes with it.

THIS article tells how the public warehouse can be fitted into the tire distribution scheme. It points out that, despite some unfavorable experiences in the past, public warehouses can help materially to reduce the cost of tire marketing. Manufacturers have not used these facilities to any great extent up to the present time. As more tires are stored in public warehouses, the organizations needed for handling them will be developed.

W. J. Buchanan is traffic manager of one of the largest warehouses in the country. He has made a careful study of the tire situation as related to warehousing and gives his conclusions here. He has presented a well-balanced and unbiased analysis which contains a number of suggestions of practical value to tire executives.

On the whole, it would appear that the tire manufacturers might well study their distribution problem with a view of determining just what service the public warehouse can perform for them. It is probable that a period of experiment will be necessary to perfect a routine service that will be economical for the manufacturer and profitable for the warehouseman.

It is not necessary to enter into long time contracts or leases nor to incur the overhead expense incident to the operation of private warehouses. There are efficient and reliable warehouse organizations at almost every important distributing center that will gladly cooperate with the manufacturer in working out a routine tire distribution service that will prove efficient and economical.

The high road to economy in distribution lies in the elimination of waste in time, material, extravagant methods, duplication of effort and overhead costs. That waste may be eliminated to the greatest possible extent, the result of the complete operation must come under a single supervision. It is only through such supervision that the total cost of distribution becomes known and wasteful extravagance disclosed. It is important, therefore, that tire manufacturers adopt such methods as will enable them to review every item of distribution cost.

RECOGNIZING this fact, some factories have established private warehouses at large distributing centers and, to a limited extent, are using public warehouses

at less important points. Past experience, however, furnishes little evidence of economy in tire distribution through the use of public warehouses, for the use has been limited and under unfavorable conditions. The service required of the warehouseman has been highly individualized and therefore costly. The volume in public storage has been too small to warrant the creation of an organization specially fitted for the work.

Warehousing, wherever or however it may be effected, has a decided influence on other cost factors. For example: Use of the warehouse enables the manufacturer to standardize costs by continuous operation regardless of conditions which may interrupt continuous distribution. The retailer's ability to serve his customers economically and satisfactorily depends upon ready access to an adequate supply of stock without excessive investment.

Analysis of the subject of warehousing must therefore be made, not from the standpoint of the manufacturer alone, nor from that of the retailer, but from that of the two combined. It is not enough that a method of distribution result in economy for the manufacturer. The economy must be effected without imposing further burdens on the retailer and without impairing his service. If possible, lower costs and improved service for the retailer also should be obtained.

Shipment of tires direct from the factory to the dealer involves many items of expense that can be avoided by the use of warehouses located at strategic distributing points. Suppose a manufacturer at Akron, Ohio, for example, has ten dealers in Chicago. Each dealer must carry a separate stock and incur all of the overhead expenses incident to maintaining a full line. The quantity of dead stock is considerably increased and bargain sales of slow moving stock become more frequent.

Less-than-carload shipments of tires require a specific style of wrapping that is not necessary for carload shipping. Each dealer must buy in carload quantities or pay the higher less-than-carload rates. Either the manufacturer or dealer must incur the extra expense of preparing shipments for less-than-carload movement.

WHETHER the retailer buys in carloads or less his turnover is necessarily slow in relation to his investment. As a rule the dealer's storage space is in connection with his salesroom and is located in high priced property with excessive insurance rates. Such property is almost invariably off track and high cartage charges accrue on all tires received.

All of these conditions are removed by the use of warehouses, either private or public. All stock can be shipped in carload quantities at the lowest possible cost for shipping and transportation. A single stock of merchandise is made to serve ten dealers instead of one. Naturally the percentage of dead and slow moving stock is reduced to a minimum and the necessity for bargain sales is removed. The warehouse is located on trackage and carloads are switched in without additional expense for switching or cartage. The modern public warehouse is specially designed for warehouse purposes and is of the highest type of construction. The insurance rates are unusually low because of the extraordinary precautions taken for fire prevention. The rapid stock and capital turnover possible under this method increases dealers' percentage of profits and cannot fail to result in improved sales representation for the manufacturer.

The dealers in outlying towns in the trade territory of the distributing center benefit in a like manner, for their high cost transportation service is short-hauled and their stock supply is close at hand.

We have already referred to the fact that less-than-carload shipment of tires requires a specific style of wrapping which is not required for carload movement. Herein lies an opportunity for economy which seems to have been neglected by the manufacturer. The freight rate on tires in less-than-carload quantities from Akron, Ohio, to Chicago, Ill., for example, is 85 cents per hundred pounds, provided the wrapping meets the requirements of the Consolidated Freight Classification. The rate on carload quantities, on which no wrapping specifications are made in the Classification, is 57 cents per hundred pounds.

The spread of 28 cents between the carload and less-than-carload rates is not sufficient of itself to encourage the use of warehouses for the sole purpose of shipping in carloads. But when we add to that saving the difference in the cost of wrapping; the difference between the cost of marking, checking and delivering less-than-carload freight to the carriers; and the cost of loading direct to cars in carload quantities, we have effected a very substantial saving which is more than sufficient to pay the cost of warehousing.

WHEN the wrapping on less-than-carload shipments does not conform to the Classification requirements the rate from Akron to Chicago is $1.06, or 49 cents higher than the carload rate on the same wrapping.

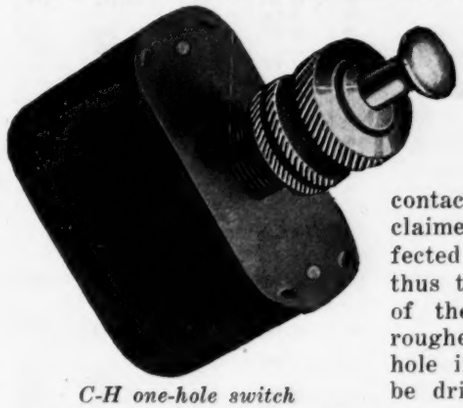
When the urgent needs of the dealer require express shipment the rate is $2.14 per hundred pounds, or $1.57 higher than the carload freight rate.

Other opportunities exist for saving money in tire distribution through a more effective utilization of warehousing facilities. As tire manufacturers come to use the public warehouse more extensively, the service rendered by the latter will be developed more fully to meet the specific requirements of the tire industry.

Simple Electric Switch Developed

A ONE-HOLE automobile switch, used for convenient control of spotlights, park lights, windshield wipers, cowl lights, motormeter lights, tonneau lights, courtesy lights, etc., has been brought out by the Cutler-Hammer Mfg. Co. Its outstanding feature lies in the ease with which it can be installed. A single 7/16-in. hole in the dash is all that is required. After this hole has been drilled the set rings are adjusted to the thickness of the dash and the switch stem is inserted. A turn of the knurled collar then locks the switch in place. Large binding screws with cupped washers facilitate wiring.

This switch is furnished with two lengths of stem, 1 in. for wooden dashes and 5/16 in. for metal dashes. The mechanism of the switch is of the knife blade contact type, which is claimed to be unaffected by vibration and thus to prevent flicker of the lights on the roughest roads. The hole in the board can be drilled or punched.



C-H one-hole switch

UNDER the list of States requiring the licensing of engineers, which appeared on page 86 of AUTOMOTIVE INDUSTRIES, issue of July 12, the States of Illinois and Wisconsin should have been omitted.

Exports of Cars, Trucks and Tires for

COUNTRIES	GASOLINE PASSENGER CARS								GASOLINE TRUCKS					
	Up to $500		$500 to $800		$800 to $2000		Over $2000		Up to 1 ton incl.		1 to 2½ tons		Over 2½ tons	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Europe														
Austria			2	$1,100										
Azores and Madeira Islands														
Belgium	578	$200,842	31	$19,743	88	$92,538	9	$18,991	639	$152,822	2	$1,006		
Czechoslovakia														
Denmark	156	67,423	48	29,360	101	97,714	3	9,104			7	7,003		
Esthonia	82	23,014			1	1,191			51	12,979				
Finland	171	52,990			12	10,671	1	2,250	149	38,889				
France	103	48,002	34	25,449	10	17,650	3	8,700						
Germany	1	50			4	5,365	2	8,550						
Gibraltar														
Greece	1	493	3	2,273	4	3,445	1	2,466						
Hungary	3	1,425												
Iceland and Faroe Islands														
Italy	79	18,585	9	4,662	2	2,932			25	9,100				
Latvia	16	4,494	2	1,500					21	5,217				
Malta, Gozo and Cyprus	2	972			1	1,041								
Netherlands	132	63,815	25	17,837	58	60,644	7	17,600	2	790	2	1,231		
Norway	542	164,139	28	20,534	103	97,434	3	7,768	157	45,362	3	2,707		
Poland and Danzig	86	24,777			4	3,656			1	700				
Portugal														
Rumania							1	2,466						
Russia					2	2,235								
Spain	568	205,845	85	58,670	211	249,821	33	83,415	142	34,968	4	3,238		
Sweden	655	311,421	196	142,697	200	197,160	4	12,959	390	100,657	6	6,810		
Switzerland	8	3,615	1	735	41	43,397								
Turkey					2	1,650								
England	216	87,441	180	116,799	141	152,734	15	40,471			60	53,575		
Scotland					1	1,910	2	6,201						
Ireland					2	2,600								
Yugoslavia	1	463			1	1,205								
North and South America														
United States														
Canada	107	34,559	562	364,995	754	819,834	62	151,294	34	25,174	157	185,572	8	$19,580
British Honduras														
Costa Rica					1	1,246					1	1,146		
Guatemala	1	493	9	6,658	7	7,948								
Honduras	4	1,457			1	1,123			3	1,084				
Nicaragua														
Panama	2	748	2	1,125	5	6,088			2	728				
Salvador	2	913	2	1,362	6	7,850								
Mexico	451	150,515	92	61,557	158	161,246	9	22,224	84	44,422	32	31,018	9	24,584
Newfoundland and Labrador	4	1,856			6	7,855								
Barbados	2	728							1	728				
Jamaica	15	5,883	6	3,030	16	16,219			20	6,980	13	16,694		
Trinidad and Tobago	9	2,888	2	1,514	1	990								
Other British West Indies	6	2,413	3	1,915	5	4,684			1	364				
Cuba	346	93,614	17	12,810	57	70,020	12	34,457	78	26,014			1	1,757
Dominican Republic	45	15,788	4	2,398	13	14,080			3	1,359			3	8,296
Dutch West Indies	9	2,143			2	2,009								
French West Indies														
Haiti	3	1,134			4	4,378	2	5,776			3	4,144		
Virgin Islands					1	870								
Argentina	66	30,478	80	45,766	71	70,528	35	113,334	8	4,213	7	7,209		
Bolivia	4	1,748			5	6,379	2	4,932						
Brazil	27	13,313	74	42,360	117	111,423	9	28,584						
Chile	10	3,744	10	7,306	18	21,577			31	16,683				
Colombia	3	1,123	5	2,747	10	11,357			2	608	1	1,060		
Ecuador					3	4,196			1	364				
British Guiana														
Dutch Guiana														
French Guiana														
Peru	12	4,493	7	4,876	26	26,697	3	7,362	26	9,500				
Uruguay	176	53,268	13	9,203	27	31,296	5	16,196						
Venezuela	33	13,157	5	3,879	9	8,886			10	3,640				
Asia														
Aden														
British India	68	32,877	23	17,219	55	51,842			6	4,544	5	4,931	1	1,613
Ceylon	6	2,842	10	5,500	17	16,652			3	3,488	4	4,514		
Straits Settlements	18	8,479			19	19,223								
Other British East Indies														
China	30	11,234	26	18,417	14	17,359	1	2,375	27	9,828				
Chosen	25	8,360												
Java and Madura	64	30,075	1	700	77	85,750	3	7,386						
Other Dutch East Indies			1	792	7	6,970								
Far Eastern Republic	1	463												
French East Indies														
Hejaz, Arabia and Mesopotamia														
Hongkong	6	2,520			13	13,737								
Japan	317	96,371	57	35,202	36	42,043	7	19,189	140	46,270	2	3,958	13	31,023
Kwantung	10	3,444							10	3,240				
Palestine and Syria	124	33,287	11	8,272	25	30,360					1	1,088		
Persia	63	17,476												
Philippine Islands	51	18,766	8	5,614	25	33,400	3	10,300	34	18,180	6	6,648		
Russia														
Siam														
Turkey	1	493			1	947								
Other Asia														
Oceania														
Australia	300	132,648	378	260,649	659	655,682	24	57,139	18	17,908	20	26,234	25	39,421
British Oceania			3	2,272	1	1,212								
French Oceania									2	1,360				
New Zealand	143	63,804	97	72,312	231	246,634	7	23,269	7	11,270	30	40,714	3	11,160
Africa														
Belgian Congo	3	1,123							6	2,184				
British West Africa			11	7,709	13	13,301			16	14,587				
British South Africa	82	35,869	93	67,997	321	311,700	2	6,516	7	5,380	1	1,162		
British East Africa	13	5,779			7	6,799								
Canary Islands	7	3,261												
Egypt	10	4,614	7	3,877	6	5,173								
Algeria and Tunis														
Other French Africa	7	2,789			4	3,903								
Liberia														
Morocco	12	4,649	5	3,786	2	1,624			4	1,580				
Portuguese East Africa	8	3,694	1	788	1	825								
Other Portuguese Africa	7	2,688							11	4,156				
Spanish Africa	2	950												
Total	6,115	$2,245,117	2,269	$1,526,966	3,846	$4,030,908	270	$731,274	2,175	$687,320	367	$411,662	63	$137,434

May, 1923 — Canadian Exports

ELECTRIC VEHICLES		PARTS	TIRES						PASSENGER CARS		TRUCKS		PARTS	COUNTRIES
			Casings		Solid		Inner							
No.	Value	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	Value	
														Europe
		$146	140	$2,530			140	$302						Austria
		133	64	762			78	234						Azores and Madeira Islands
		227,726	1,471	15,425			541	1,413	42	$29,479			$534	Belgium
		31	4	313			6	52						Czechoslovakia
		235,866	5,111	65,773	47	$1,405	3,959	6,227	2	2,780			8,586	Denmark
		184	100	1,928			115	264						Esthonia
		203	460	5,383			349	675						Finland
		598,504	2,625	15,365	6	120	2,587	2,346						France
		1,226	200	2,770			220	466						Germany
		595							1	1,422				Gibraltar
		3,397	133	2,560	29	866	222	452						Greece
														Hungary
		671	183	2,273	8	165	344	608						Iceland and Faroe Islands
		15,544	3,027	36,665			3,908	6,524						Italy
		582												Latvia
		311	86	965			38	79	2	966				Malta, Gozo and Cyprus
2	$4,000	13,101	454	8,506			395	616	52	34,878			104	Netherlands
		23,328	3,471	57,802	27	1,091	2,747	4,440					557	Norway
		36,757							2	1,892				Poland and Danzig
		1,292							9	12,627			7	Portugal
		128	122	1,703			133	234						Rumania
		86												Russia
		26,423	359	5,431	83	1,893	374	606	26	34,197			9,607	Spain
		40,042	5,065	68,694	102	3,006	3,881	6,452	214	117,774			355	Sweden
		3,526	129	2,606			133	340	3	2,708			141	Switzerland
		1,325							3	2,244			157	Turkey
1	1,705	557,670	39,953	333,723	2,473	52,244	16,745	27,548	576	386,794	8	$4,648	90,823	England
			154	866	4	114	10	47						Scotland
			1,045	10,136			1,122	2,163						Ireland
		62	304	4,635			386	931						Yugoslavia
														North and South America
		2,157,241	5,078	57,139	179	5,782	2,070	3,130	13	5,705	2	3,000	74,733	United States
														Canada
1	2,100	215	53	500			34	59						British Honduras
		977	89	2,253	4	92	66	203						Costa Rica
		1,471	138	3,089	4	94	186	396	4	3,085			113	Guatemala
		2,955	92	1,203	16	727	172	336						Honduras
		373	36	690	8	205	27	62						Nicaragua
		22,568	788	8,637	30	619	628	1,061						Panama
		1,450	60	1,502	26	745	213	487					9	Salvador
		84,077	5,912	56,180	39	1,929	9,728	11,216	24	29,302				Mexico
1	2,732	2,061	165	2,575	6	149	184	348	8	6,537			1,404	Newfoundland and Labrador
		1,710	65	774			41	70						Barbados
		16,358	711	8,657	74	1,472	1,141	1,997						Jamaica
		6,390	649	6,556	10	270	614	795						Trinidad and Tobago
		2,836	105	872			117	173	14	7,906			316	Other British West Indies
		156,230	6,437	74,458	1,211	31,176	8,581	13,206	14	13,677				Cuba
		8,886	611	6,842	29	777	714	1,326	5	4,278			28	Dominican Republic
		541	76	771			79	272						Dutch West Indies
		1,371	179	1,476	12	367								French West Indies
		6,836	228	2,120			236	581						Haiti
		2,166	32	158			60	121						Virgin Islands
		693,001	7,009	80,130	155	3,984	9,895	14,749	215	162,980			8,860	Argentina
		774	300	4,824	36	980	263	542	6	5,076				Bolivia
		154,477	2,600	26,472	30	800	88	84	3	3,767			12,658	Brazil
		23,113	717	10,600	26	755	324	451	9	13,441	1	1,051	175	Chile
		11,238	446	7,092	22	602	506	1,043					230	Colombia
		1,177	153	3,253	8	191	183	393						Ecuador
		2,071	83	1,047	22	286	148	270	10	6,940			185	British Guiana
		328	42	312	4	94	52	68						Dutch Guiana
		136												French Guiana
		9,424	995	15,268	33	816	1,077	1,978					43	Peru
		13,672	964	10,779	4	52	365	1,424	22	23,322				Uruguay
		9,066	1,493	14,438	24	442	1,986	3,151	4	4,146			88	Venezuela
														Asia
											2	668	43	Aden
		35,398	412	4,694	99	3,373	281	532	197	79,029	68	22,712	18,662	British India
		2,964	244	2,770			126	378	31	13,593	6	2,004	4,246	Ceylon
		11,952	1,097	11,202	174	3,656	445	670	77	25,516	24	8,016	23,507	Straits Settlements
									2	688	2	668		Other British East Indies
		9,912	1,080	12,002	18	432	652	884	56	41,821			52	China
		1,940	790	6,770			199	387						Chosen
		20,426	829	11,167	217	6,811	393	904						Java and Madura
		2,228	28	469	16	299	16	38	166	77,093			479	Other Dutch East Indies
		121												Far Eastern Republic
									4	5,432				French East Indies
		419												Hejaz, Arabia and Mesopotamia
		2,774	10	254			50	150	4	4,810				Hongkong
9	19,490	106,474	3,936	40,258	445	6,110	980	1,957	8	5,428			6,886	Japan
		1,079	80	700										Kwantung
			277	4,528			131	231					197	Palestine and Syria
		5,014	2	23			2	3						Persia
2	4,017	80	2,449	47,871	480	12,872	1,901	5,215						Philippine Islands
		12,262												Russia
									11	4,111			1,292	Siam
		252												Turkey
		19												Other Asia
														Oceania
		115,432	4,428	68,047	229	7,892	3,175	6,499	939	393,903	640	216,798	89,166	Australia
		591	16	176										British Oceania
		583	30	345	2	160	2	6						French Oceania
		48,992	10,006	131,231	430	20,134	6,774	20,841	172	127,566			7,282	New Zealand
														Africa
		733	24	332			24	56						Belgian Congo
		14,520	103	2,837			120	359	11	2,942	27	11,336	3,949	British West Africa
		39,894	6,558	59,340	2	91	7,056	11,550	456	188,227			2,077	British South Africa
		2,434	236	2,141	6	149	172	300	8	2,732	10	3,300	758	British East Africa
		2,058	188	2,490	108	2,534	216	352	2	2,397			7	Canary Islands
		2,764	822	7,088			303	394					19	Egypt
		50												Algeria and Tunis
		3,938												Other French Africa
		87												Liberia
		9,091	6	120										Morocco
			44	560			44	100						Portuguese East Africa
		729	6	93			300	106						Other Portuguese Africa
		208												Spanish Africa
16	$25,044	$5,639,466	134,667	$1,474,989	7,023	$178,823	101,306	$174,923	3,427	$1,893,211	790	$274,241	$368,335	Total

Increase of Static Load on Front Axle Caused by Four-Wheel Brakes Not a Serious Factor

Editor, AUTOMOTIVE INDUSTRIES:

I have been much interested in your articles and comments on four-wheel brakes and am rather surprised that the obvious fact has not been brought out, that four-wheel brakes do not increase the static load on front axles, front springs, etc., over the load imposed by rear wheel brakes capable of locking the rear wheels, when the deceleration is the same in both cases.

In holding down the speed of the car on a hill of say 10 per cent grade to 15 m.p.h. the car with four-wheel brakes does not impose any greater static load on the front axle, pivot axles, front springs, front wheel bearings, etc., than the rear wheel brake equipped car under the same conditions. Four-wheel brakes only impose a greater static load on the front axle when they are used to give quicker deceleration than can be obtained with rear wheel brakes.

I am inclined to think that four-wheel brakes capable of locking all wheels will rarely be used to stop a car in the least possible distance except to avoid a fatal accident, because such rapid deceleration, approximately double that of rear wheel brakes only, is not only uncomfortable to the passengers, but may actually injure them unless they are prepared for the stop and have something substantial to hold on to.

A stop from a speed of 30 m.p.h. in 70 to 80 ft. which can be accomplished with a car having rear wheel brakes only, is as quick as should be indulged in under ordinary conditions unless the driver is alone in the car having the steering wheel to brace him. A deterrent to making a quicker stop than the average car is the danger of being run into by the car behind. This obtains in the majority of city brake applications. The average driver with a four-wheel brake equipped car will not make quicker stops than he could make with a car with rear wheel brakes, in more than perhaps 5 per cent of the decelerations he effects. This indicates that the increased static load upon the front axle is very rarely incurred.

I have driven cars equipped with four-wheel brakes capable of locking all wheels, making stops in the least distance possible, without the front spring bumpers with which the cars were equipped violently striking the underframe. These same cars would strike the bumpers most violently when run over a depression in the road at high speed, showing that the front wheel brakes did not impose a greater static load on the front axle, etc., than already had to be provided for. Most conditions in connection with the application of four-wheel brakes can very easily be met, though only by added complications. There are, however, some problems that present difficulties, such as:

1. The avoidance of locking the front wheels when making a turn with the brakes applied.
2. The maintenance of sufficient travel of the foot-brake lever, after taking up the slack of the mechanism, to still leave enough travel to properly apply the brakes after a little wear has taken place.
3. The provision of sufficient leverage to apply all four brakes fully, without undue effort on the part of the driver where no assistance from complicated "servo" attachments is used. This problem is exceedingly great in the case of heavy cars, as, with rear wheel brakes only, it is difficult to provide sufficient leverage to lock the wheels without considerable effort and maintain sufficient travel for the brake pedal to have something left for wear. With the same leverage, double the pressure on the pedal will be necessary to lock front and rear wheels and there will be double the slack to take up. This may result in frequent brake adjustments, even though the additional front brake shoe surfaces may give double the total area to that used in the case of rear wheel brakes only.
4. The provision of a simple means of adjustment for wear on each brake shoe, that can be quickly and easily made by the average driver.
5. The maintenance at all times of proper equalization.

DAVID FERGUSSON.

More About the Sekine Car

Editor, AUTOMOTIVE INDUSTRIES:

Referring to the description of the "Sekine" car in your June 21 issue, I wish to advise that bronze bushings are used in the spring eyes rather than wood bushings, as stated. Wood bushings are used in the entire brake rigging and in the steering gear, including the steering column. It is most desirable to prevent wear in the spring eyes inasmuch as they hold the wheels in position. To minimize wear we are using large diameter spring bolts which are drilled out hollow, forming a reservoir for lubricant. Inasmuch as the load comes on the top side of the spring bolts, the lubricant is fed to the bottom side of the bolt, thus insuring lubrication in spite of possible neglect from the operator.

In referring to the elimination of the differential, it is stated that "some resistance is encountered on a wet or slippery pavement with the front wheels cramped in an extreme position." I fear that this statement might be

misconstrued. The slight resistance that is encountered will be felt whether the pavement is dry or wet and feels like a dragging brake. The car proceeds positively in the direction that the wheels are turned. This dragging sensation, however, is only when starting, as at all other times one is unconscious of the absence of the differential.

With the resilient connection between the two rear wheels, I have found greater security in driving around turns than with a car equipped with a differential.

AUSTIN M. WOLF, Chief Engineer,
I. Sekine Company, Inc.

Injury to the Tire Business

Editor, AUTOMOTIVE INDUSTRIES:

A matter has come to our attention concerning which we believe manufacturers of automobile tires should be advised.

There are small tire repair shops representing an investment of only a few thousand dollars which are trying their best to buy frictioned fabric, breaker, tread, stock, etc., for the purpose of building this prepared material into tires which are to be cured in molds bearing their name as regular tire companies. This makes it possible for a tire repair shop to blossom forth as purporting to be a regular manufacturer of tires by simply investing a few hundred dollars in a couple of molds and cores.

Most of these shops already have small vulcanizers which they have been using for retreading work and which can be adapted to making tires. Through their advertising these concerns lead the public to believe that they are really tire manufacturers.

Such a practice is an imposition on legitimate tire manufacturers and we feel that it should be called to their attention so that none will be so foolish as to encourage these concerns by selling them the necessary raw materials. Any manufacturer who sells raw materials to these repair shops by so doing enables them to supply the market with tires and thereby simply reduces the size of the field in which real tire manufacturers can expect to sell their tires.

Such competition is not based upon a fair and sound basis and consequently should be discouraged and suppressed.

R. W. McCREARY,
McCreary Tire & Rubber Co.

Computing Car Replacements

Editor, AUTOMOTIVE INDUSTRIES:

Please let me take exception to a statement printed on page 1254 of AUTOMOTIVE INDUSTRIES for June 7, 1923. The article to which I refer reviews statistics recently published by John Moody and concludes with a paragraph referring to a record of the production and use of automobiles which was compiled by myself. The statement is made that one column of this table shows the number of cars eliminated annually and that this estimate is based on the doubtful expediency of arbitrarily fixing the life of a car at five years.

I am sorry that such a statement should have found its way into your usually carefully edited pages. The reference is to a report I published some two years ago entitled "The Automobile Industry and Its Future." In that report I devoted pages 10, 11 and 12 to explaining a new method of computing eliminations. The method that you state that I used is one that had previously been used by many workers in this field and I went to much pains to develop a new and more nearly valid method.

I only used the old method for the early years of the history of the industry before registration figures were available. Moreover, even in that part of my work I did not use five years as the average life of the cars, but six years. From 1911 on I utilized an entirely new method which I believe is logically sound and which is in no way related to the method described in your article.

LEONARD P. AYRES,
Vice-President, Cleveland Trust Co.

Steering Systems Discussed

READERS of AUTOMOTIVE INDUSTRIES who have followed the discussion of various problems relating to steering systems which have appeared in these columns from time to time during the past year will recall that one disadvantage cited against the use of transversely inclined steering knuckle pivots is the increased effort required in steering due to the fact that the front end of the car is raised a certain amount when the wheels are moved from the straight ahead position.

Contributors have expressed different views as to the importance of this effect and the amount which the car is actually raised when the front wheels are turned from straight ahead to full lock position. To clear up this point we requested A. M. Dean, chief engineer of the Rubay Co., to make actual measurements on a Rubay chassis, which is equipped with transversely inclined steering knuckles. The following information is abstracted from our correspondence with Dean:

"When transversely inclined pivots are used the car is raised when the wheels are turned for the straight ahead position, but this effect is comparatively slight. It has somewhat the same effect as the fore and aft rake of the axle in bringing the wheels back to position. The steering of Templar cars which I built was relatively easy and it is my opinion that in designs in which the inclination of the pivot does not exceed 12 deg., there is no noticeable effect on the steering. I might add that these pivots are mounted on Bock roller bearings.

"The same construction is employed on Rubay cars. The steering is not appreciably changed by the inclined pivot.

"I have checked up one of our cars to determine the amount the front end is raised in steering, from straight ahead to full lock position, and found the amount to be hardly 1/16 in. I made this test with chassis on rims (without tires) so that the tire deflection would have no effect."

Figures compiled from steering gear data which we have collected from various representative car manufacturers show that the average steering wheel moves through 0.84 rev. in turning the front wheels from straight ahead to full locked position, or about 48 in. circumferential travel in the case of an 18 in. steering wheel. Assuming a weight of 1500 lb. on the front wheels of a car, it will require approximately 94 in.-lb. to raise it 1/16 in. It is thus seen that, with a frictionless gear and connecting parts, about 2 lb. pull at the rim of the steering wheel will be required to raise the car the amount indicated. This is, of course, in addition to the effort required to overcome the friction of the gear, its connecting parts and the resistance to motion between tires and road. It is worth noting, however, that in turning the wheels from a cramped back toward the straight ahead position the steering effort is decreased by the same amount by which it is increased in the reverse direction. This produces the self-righting action referred to by Dean.

ENGINEERING EDITOR.

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Making Dealers Financially Sound

HOW can a manufacturer best help his dealers to become financially sound? Many factories are seeking the answer to this question. Various expedients are being tried, some of which promise to be helpful. Special traveling men equipped to give practical help on financial problems, visits by factory representatives to local bankers, deposits of factory funds in various banks in return for extensions of dealer credit, and other similar means, are being tried. These all aim at direct assistance to the dealer.

An indirect method exists which may be of considerable value if utilized more fully. The dealer can be encouraged to handle a reasonably wide variety of automotive equipment in addition to complete vehicles.

Retailers who do a good business selling tires, bumpers, mirrors, spotlights, and numerous other items of equipment are not eaten up by overhead costs when vehicle sales are slow. They can keep their organizations intact even if the demand for cars is not brisk for a few months. The burden of selling costs is distributed over a large number of items.

Profits from equipment sales may go far toward providing the car dealer with an adequate bank account, and thus result in a financial stability which he might never have achieved simply through direct credit assistance.

Whatever activities permit the dealer to stabilize profits takes some load from the factory. The all-around automotive merchant is in a good position to sell cars and is interested in servicing them when he has a chance to sell additional equipment to owners as they come into his service station.

Headlamp Regulation

STRANGE as it may seem, the mountain is coming to Mahomet. The manufacturer is usually a step behind the legislative activities of the various States, but, a representative of the Motor Traffic Commission of New Jersey recently advised the members of the Society of Automotive Engineers that present head lamp standards are entirely acceptable. The statement was a pleasant surprise.

There was a tail on the kite, however. The Traffic Commission representative said in substance: "Your standards are fine but they are not apparent when your customer takes his car out on the road at night. Sixty per cent of the new cars delivered to the owners have head light adjustments that are absolutely illegal and dangerous according to your own standards. Thirty-four per cent are passable and only 6 per cent are correct and in accordance with the standards adopted by the committees of the Illuminating Engineers Society, the S. A. E. and the Bureau of Standards. Unless the automobile manufacturer can find some way to educate his dealers and through them, his customers, you will be confronted with head light legislation that will be more drastic than anything you have seen."

What is the sense of spending money for good, legal head lamp equipment which is hurriedly assembled on the car and finally rushed along to the customer after a knockdown shipment? If the dealer does not know enough to spend a few minutes in locating and adjusting the focus of the head lamps, he must be educated to do so. He is the connecting link between manufacturer and ultimate owner and about the only way in which the ideals or standards of the producer will ever reach the driver.

New Jersey is not alone in this criticism and ultimatum. Ten other northeastern States which are representative of the national trend, have accepted the present standards and will insist upon their enforcement. Failing this, more stringent legislation is contemplated. The standards are fair and can be met by the vast majority of manufacturers' existing standard equipment. It seems to be up to the manufacturer to induce the automotive dealer to fulfill his function.

Shortage of Skilled Labor Best Overcome by Training of Apprentices

SHORTAGE of skilled labor in every period of intense activity is one of the greatest difficulties confronting industry. There is none too much common labor but lack of it is not such a serious handicap. It is this shortage which leads employers to bid against each other for help much as they do for materials when they are striving to increase production.

This competition for labor and supplies sends prices up and cuts profits just at those times when it might be possible to make the most money by meeting the demands of the public. The methods now pursued are uneconomic and harmful to everyone—employer, worker and ultimate consumer. They frequently result in inflation and speculation with the inevitable aftermath of depression.

Scarcity of skilled help backs up all along the line, from the raw material to the finished product. It limits output and brings into play the law of supply and demand which sends prices skyrocketing when the curve of output falls below the curve of consumption.

There is no problem for which a solution cannot be found if it is studied hard enough. Employers of the country could find an answer to this question if they went at it earnestly and cooperatively. Damning the immigration laws is not sufficient because the limitations imposed by the Government, strict as they are, have not reduced materially the influx of skilled mechanics. As a matter of fact the number of skilled workers coming to our shores always was negligible.

The New York Building Congress has decided that if the shortage ever is to be abridged it must be through revival and amplification of the apprentice system which flourished years ago, but seems to have gone out of fashion. Strangely enough, the unions in the building trades are not held responsible for the lack of apprentices, but rather the employers themselves.

Burt L. Fenner, one of the foremost architects of New York, who is chairman of the apprenticeship commission of the Building Congress, declared at a luncheon the other day that in no case is an employer in the construction industry in New York using as many apprentices as the unions will permit. Nor is it due to any lack of applicants. The type of boys whose parents once insisted that they should join the "white collar" class have been lured to the trades by high wage scales and they are anxious to learn but can find no one willing to teach them.

When employers are urged to take on some of these boys, Fenner said, they refuse to assume the responsibility. They don't want to lower the efficiency of their crews by including beginners in them. And yet there are fewer bricklayers today than there were ten years ago.

Hugh Frayne, vice-president of the American Federation of Labor, was just as emphatic as Fenner in urging expansion of the apprentice system. It was his contention, moreover, that the movement should be expanded to all trades. He declared that the training of apprentices is a national problem. There is no danger to organized labor in skilled workers, he said, but rather in poorly trained mechanics.

The automotive industry is not as dependent as the building trades upon thoroughly trained workers and it has no union troubles to contend with. For that reason it is in a better position to train workers to the requisite degree of skill. A good many companies have found this to be the only answer to their difficulties. They have broken up into several parts operations which hitherto required the services of highly skilled men and have been able to train labor for the tasks required in a few days.

This in itself is a modification of the apprentice system and it may point the way to other industries which are dependent for success upon volume production. It certainly can be used effectively in plants where most of the operations are performed by machines. As a matter of fact other industries can learn many production lessons from automotive manufacturers.

Complete Victory Scored by Willys

Friendly Interests Buy Overland Stock

Court Decision Eliminates Danger That His Control of Company Will Pass

BUFFALO, July 24 — Interests friendly to John N. Willys have bought the 739,000 shares of Willys-Overland stock held by the Willys Corp., which is in a receivership, sale of which carried a threat of loss of control of the Toledo concern by the man who has made it the big success it is. The transfer of this fought-for stock insures the retention of John N. Willys as president of the Willys-Overland Co.

There was no immediate danger of this control being lost because the preferred stockholders are so strongly entrenched. Not until all their claims have been settled would the common stock figure in the matter of control. It was a possibility, though, that friends of Willys would not risk, and they took steps to secure the Willys-Overland stock held by the receiver of the Willys Corp., thus removing all danger of any future upset.

Toledo Syndicate Purchaser

The final word in the dispute over this block of stock was spoken today by Judge Knox of the United States District Court, who accepted the bid made by a Toledo syndicate headed by Thomas H. Tracey of that city, which all along has been insisting that the future of the Willys-Overland Co. depended upon the retention of Willys as president.

As accepted by the court, the Tracey bid was amended today. It provides that Tracey pay the receiver $3,000,000 and give an agreement to pay $500,000 additional in case, at the final liquidation of the Willys Corp., the receiver has not sufficient funds to pay all the Willys Corp. liabilities.

The Tracey plan includes provisions for participation by first preferred Willys Corp. stockholders, makes certain the return of complete control in Willys-Overland to Toledo and gives Willys Corp. first preferred stockholders recognition, all points for which John N. Willys had been seeking to win.

When Judge Knox considered the case in his New York City court the early part of the month, there were three bids up for his consideration—that made by the Tracey syndicate, another by the Willys Corp. bankers' and creditors' committee and a third by Overland distributors in Milwaukee and Detroit. In the Buffalo court this third bid did not come up for discussion.

Before the decision today the bankers' and creditors' committee increased its bid to $3,500,000, the same as Tracey's, but Judge Knox gave it as his informal opinion that the bankers' and creditors'

(*Continued on page* 198)

Business in Brief

NEW YORK, July 26—While the volume of business is considerably above normal for this time of the year, there is a noticeable quieting in trade and industry.

The favorable signs last week were continued heavy car loadings and another drop in Federal Reserve rediscounts. Much hinges on the financial returns in the agricultural sections, which up to this time have not appeared too promising. The general trend of commodity prices continues downward.

Recession in iron and steel production continues, and reports state that there will soon be a shutting-down of a number of blast furnaces. While the falling off in steel production is slight, that of pig iron is greater and prices of the latter have declined. On the whole the situation is satisfactory and a revival of buying is expected in the fall.

Prices of wheat were carried to a new low figure last week after which a slight rally occurred. The market remains very irregular, and the horizon is being scanned for possible means of helping the farm situation.

Freight car loadings for the week ending July 7 aggregated 854,748 cars. While this figure is considerably lower than that of the previous week, when loadings went well over the million mark, it was somewhat to be expected because of the intervening holiday. Loadings show that conditions are well above what they were last year.

After a long series of downward movements, the stock market rallied and showed a decided improvement. How long the present status will last remains to be seen. This slowly mounting strength of the market has probably been helped by more favorable news from Europe and the slight rally in wheat price.

Willys Corp. Wind-Up Now Appears in Sight

Receiver Expects to Have $1,500,000 for First Preferred Stockholders

NEW YORK, July 25—Now that the Tracey syndicate has purchased the 739,866 shares of Willys-Overland common stock from the receiver of the Willys Corp., an early winding-up of the affairs of the Willys Corp. seems possible.

Even before Receiver Caffey cashes Thomas H. Tracey's check for $3,000,000, which is due in ten days, he has $2,614,000 cash on hand, so that with the Tracey money he will have $5,614,000 with which to satisfy creditors.

In addition to this Receiver Caffey has as assets securities of the Fisk Rubber Co., Knight-American Patents Co., Connecticut Telephone & Electric Co. and the Doehler Die Casting Co., which are given a minimum valuation of $1,000,000.

Caffey, therefore, expects to have more than $5,500,000 for immediate use and $1,000,000 available later. Against these assets total liabilities are $8,654,000, including $400,000 administration expenses of receiver, and assuming that all cases in liquidation result adversely and that interest and penalties accrue for two years. Included in this list of liabilities are more than $3,000,000 of claims which may not have to be paid.

Accordingly, Receiver Caffey believes he will have a surplus of about $1,500,000 after paying all claims, which will accrue to the advantage of first preferred shareholders of the Willys Corp.

Decision Clears Overland Situation, Willys States

BUFFALO, July 25—Following the sale of the Willys-Overland common stock to the Tracey Syndicate, John N. Willys said:

"The acquisition of this block of stock removes one of the biggest elements of uncertainty in the Willys-Overland situation. It means a continuance without interruption of present policies. The stock acquired by my associates and myself will definitely pass into investment hands as soon as formalities are complied with, and it will not be offered on the market.

"The policy of the company will be to hold large cash reserves until the future of the automobile market is clearly seen. The company's cash is now $8,914,000, or more than enough to pay the $6,000,000 notes due in December."

20 Per Cent Decline in Plant Operations

Reported for First Week of June but Not Likely to Continue Through Month

NEW YORK, July 23—Reports received for the first week of July show a 20 per cent curtailment in operating schedules of automobile manufacturers as compared with the pace followed in June. This falling off is noted on the part of two-thirds of the producers and does not refer to Ford, which increased its schedules and established new daily and weekly production marks.

The week was short, a holiday entering to cut down the number of working days, and it is not likely that the same percentage of decline will prevail throughout the month. Production of cars and trucks for the month as a whole, however, will not equal the 376,000 total output reported in June, due partly to fewer working days and partly to the generally reduced schedules on which the industry is operating.

Caution Marks Movements

Caution is marking the movements of car manufacturers in placing commitments for material. While some of the larger producers have filed orders with parts makers covering their requirements to December, others are directing July deliveries on orders placed for August and September and are not reordering at this time.

Several factors enter into this situation. Manufacturers, who are availing themselves of the lull in operations to plan schedules for the remainder of the year, are watching closely any development that would tend toward greatly reduced sales in the fall. As in the past, production will be governed solely by demand and producers will work against warehousing of stocks or overloading dealers.

Another factor, no less important in its bearing on commitments, is the fact that this between-season period finds the average manufacturer with sufficient material on hand for use in cars now under production and hesitant to place orders for supplies to meet the needs of models in the process of development until all changes are decided upon and operating schedules are definitely fixed.

Conditions in the retail field are satisfactory, the falling off in sales from previous high levels not being unusual to the season and indicating no pronounced diminution of buying interest. The volume of purchases is well in excess of last year.

Truck operations are proceeding along conservative lines, with a steady movement forward. City buying is being well sustained. Output of buses is greater with their more general adoption as a means of transportation.

A somewhat better tone is apparent in the farm tractor branch of the industry, makers reporting shipments to Southwestern States during the past week. Tractors used in industrial work show a healthy demand, with the result that factories specializing in this kind of vehicle are operating on exceptionally high programs.

Four-Wheel Brakes Involve Cost, and Types Imperfectly Developed Might Prejudice Public Against Them

AN INTERVIEW WITH H. H. HILLS,
Vice-President of Distribution of the Packard Motor Car Co.

By D. M. McDonald, Detroit News Representative of the Class Journal Co.

Detroit, July 23.

THE importance of four-wheel brakes to the industry consists primarily in that they permit of much faster and safer driving speeds and acceleration by offering the factor of more rapid and more effective speed reduction.

This was brought out in a talk I have just had with H. H. Hills, vice-president of distribution of the Packard Motor Car Co., in which he outlined this as a reason for Packard's adoption of four-wheel brakes for its single eight model, a car distinguished for its high speed range and power.

In cars of relatively light weight and low speeds he thinks four-wheel brakes are of considerably less importance so far as actual safety in driving in normal traffic is concerned, but they offer an important factor of safety in heavy traffic and on wet pavements.

With a number of light car manufacturers adopting four-wheel brakes for presentation in models later in the year, Hills said the four-wheel brake would have its first test of general popularity; a test that would be immediately successful, or result in temporary discrediting, by the actual merit of the individual four-wheel brakes employed.

Manufacturers cannot go in for cheap four-wheel brakes and expect success to follow, he said, for good four-wheel brakes involve cost. Those manufacturers whose brakes are sound will find that they mean a considerable advance in the price of the car, over ordinarily equipped models. It will be useless to attempt to convince the public of the merit of four-wheel brakes on any other basis. If the public wants four-wheel brakes and is willing to pay the additional cost involved, the idea will be successful immediately.

Good four-wheel brakes offer the advantage of more complete control of the car at all times with the disadvantage of increased cost, Hills declared. From the ordinary sales standpoint they offer both a good selling point with the resistance that increased prices entail. The initial cost objection is met to a considerable extent by the fact that they will permit of economies in tire life, wear on brake linings, less frequent adjustments and in general lower upkeep costs.

As used on the single eight the four-wheel brake has been very successful, according to Hills, but thus far the company has not considered its use on the single six because of its lighter weight and lower speed ranges, conditions which make conventional brake types satisfactory.

In considering the adoption of four-wheel brakes Hills cited the necessity of designs being given thorough trial by manufacturers, as the tests by Packard have shown many defects that might be incorporated in four-wheel brakes which would make them far more hazardous than the conventional brakes. Absolute equalization is necessary if serious difficulties are to be avoided.

Types of brakes which under certain circumstances may interfere with steering, or which are susceptible to derangement, leaving the car without braking of any kind, offer dangerous possibilities to manufacturers, and might have the effect of discrediting the entire four-wheel brake theory in the public mind. This can be avoided by careful analysis and by not attempting to go into four-wheel brakes on a low price basis. Only good brakes can have a lasting place in the industry.

Standard Parts Division Sold Paterson Purchaser

DETROIT, July 23—Dallas E. Winslow, who recently acquired the Paterson Motor Car Co. at Flint, has added the Cincinnati division of Standard Parts Co. to his holdings, and declares he will move this plant to Flint, as part of his plan to produce a new line of Paterson cars.

The purchase includes all tools, dies, stock and all service rights. The purchase involved a $400,000 deal, Winslow said.

A special department will be established by Winslow to continue the Standard Parts service.

Jackson Appointed to Head Locomobile

Succeeds Col. Havens, Who Retires to Devote Time to Private Interests

NEW YORK, July 23—Edwin B. Jackson has been appointed vice-president and general manager of the Locomobile Co. of America, one of the subsidiaries of Durant Motors, Inc., succeeding Col. E. H. Havens, who has been head of the Locomobile unit since its formation by W. C. Durant. Colonel Havens will continue as a director of the company and will work with Jackson at Bridgeport until the latter learns the details, when he will devote himself to his private interests.

The retirement of Colonel Havens follows the resignation of a week ago of E. A. Travis, for years sales manager of Locomobile, and brings to the head of the Locomobile unit a man who has been identified with the automobile business since 1902, when he started as a salesman for John Wanamaker, at that time Ford agent in New York City.

For ten years Jackson was connected with Packard, resigning as president of the Packard Motor Car Co. of New York to become vice-president in charge of sales of the Willys-Overland Co. After five years in that capacity he resigned to take over the sales of the Wills Sainte Claire in the East, giving up this position a few months ago to join the Durant forces in the capacity of sales manager of the Princeton line.

As receiver of the old Locomobile company and general manager during the receivership, Colonel Havens made a remarkable record and was prevailed upon by W. C. Durant to remain with the new company in charge of its affairs until the reorganization was completed.

Windsor and Moorman Are Wills Executives

DETROIT, July 23—Incorporation papers filed in Boston for Wills Sainte Claire, Inc., named Asa Burton Nelson of Cambridge as president and D. S. Carpenter of Winchester as treasurer. It is explained here that they are incorporators and not officials.

C. Harold Wills is president and general manager of the company, with Robert Windsor of Kidder, Peabody & Co., chairman of the board. A. H. Moorman, who was formerly an officer of the Security Trust Co., and who managed the old Wills company during the time it was in receivership, is treasurer.

OLIVER RIM SALE APPROVED

ATLANTA, GA., July 24—Sale of the plant of the Oliver Rim Co. of Atlanta to a syndicate composed of Atlanta business men has been ordered by the Federal Court here, the purchase price being $85,000. The syndicate has reorganized the business with W. Woods White as president, and will continue operation of the Atlanta plant.

BUY YOUR COAL EARLY, GOVERNMENT ADVISES

WASHINGTON, July 25—A precautionary warning that the automobile and other industries buy their winter coal during the next two or three months has been issued by the United States Department of Commerce. The warning is based on a statement just issued by the Federal Fuel Distributor, calling attention to the fact that most industries generally thus far have failed to secure their coal requirements for next winter's use.

"The department strongly urges upon the automobile and other industries," the warning says, "the importance of safeguarding the continuance of operations in their industry by the prompt purchase and shipment during the next two months of coal for fall and winter consumption."

Triangle Truck Elects H. D. Minich President

DETROIT, July 25—Three new officers and five new directors have been elected by the Triangle Motor Truck Co. of St. Johns, Mich., which is preparing to extend the manufacture and sale of its vehicles. The company will have $100,000 in new money through the sale of stock within the company, authority for which was granted recently by the Michigan Securities Commission.

The new officers are H. D. Minich, president and general manager; B. F. Wright, vice-president in charge of engineering and manufacturing, and W. L. Beitler, Jr., secretary and treasurer. Each of these men were associated with the former Republic Motor Truck Co. of Alma, Minich as vice-president and director, Wright as chief engineer, and Beitler as office manager.

The new directors include the above-mentioned officers and M. W. Malseed and W. C. Searl. Former directors who continue are F. C. Burk, Eugene Hart, E. E. Emmons and C. S. Clark.

Ford's Domestic Output in 1923 Reaches Million

DETROIT, July 24—Domestic production of Ford cars and trucks for 1923 reached 1,000,000, July 20, between two and three months earlier than in 1922.

The first millionth car built by the company in 1915 took twelve years to reach. Production is now on such a basis that a million production this year was a matter of twenty days more than six months.

McCord, New Owner, Made Apperson Head

Van Sicklen Becomes First Vice-President and General Manager of Company

KOKOMO, IND., July 20—Don C. McCord and Maurice Rothschild, New York capitalists, who have purchased a majority of the stock of the Apperson Brothers Automobile Co., were added to the board of directors at a meeting here yesterday. McCord was elected president.

Other officers are: First vice-president and general manager, N. H. Van Sicklen; second vice-president, Edgar L. Apperson, and third vice-president, B. C. Buxton. The executive committee is composed of McCord, Rothschild and Van Sicklen.

It was announced following the meeting that steps will be taken immediately to increase production and intensify sales activity.

The change in Apperson ownership follows the refinancing of the company last winter, the stock purchased by the New York capitalists being that which was deposited with bankers. Sale of a $700,000 bond issue to provide new working capital was undertaken.

In May the company announced that the bonds had been sold, a large amount having been taken by creditors, and that three-year debenture notes for $383,000 in addition had been disposed of, providing $1,083,000 of new working capital. At the same time Van Sicklen succeeded E. L. Apperson as president, Apperson becoming chairman of the board. This was said to have been the first time the Apperson company had interested outside capital.

McCord and Rothschild are widely interested in other automotive concerns, among them being Republic truck, Standard Motor Car Co. and Union Drop Forge. McCord is president of the Standard Motor Car Co. of Butler, Pa., and Rothschild is treasurer of the same concern, as well as being vice-president of the Republic Motor Truck Co.

Mitchell Creditors Meet to Hear from Appraisers

RACINE, WIS., July 23—An important meeting of creditors of the Mitchell Motors Co., Inc., is being held here today to receive the formal report of the appraisers and to arrange for the disposition of the assets.

The public sale will be held Aug. 15, and it is stated that there is a combination of local capital which will be ready to enter a bid for the plant as a whole, while outside interests have asked for the inventory and appraisal report.

The Mitchell plant, while not being operated on car production, is employing a part of the regular force in making up parts and keeping the service department in action.

Moto-Meter Winner in Appeal Decision

Higher Court Sustains Lower in Upholding Validity of Boyce's Patents

PHILADELPHIA, July 23—A decision in favor of Harrison H. Boyce and the Moto-Meter Co., Inc., has been handed down by the United States Circuit Court of Appeals for the Third Circuit in the appeal of the Pyrene Manufacturing Co. from a similar decision handed down in the United States District Court for New Jersey.

Patent Fully Upheld

The validity of the Boyce patents was fully upheld in the decision, which was written by Judge Wooley, who holds that "we are of the opinion that the novelty of the invention of the patent has not been negatived by prior use, and that, accordingly, the patent is valid. We are also of the opinion that as the 'temperature responsive element' of the patent claims are not limited to alcohol but extend to such expansive metals as are employed by the defendant in its device, the patent is infringed."

Judge Wooley goes into extensive review of the case, which involves the validity of the trouble-indicating instrument patent, holding that the prior public uses of the invention of the patent appeal to him as merely incidental and casual uses, believing that, while the instruments used on these occasions may have performed in the manner of the patent, such performance, if it occurred, seems not to have impressed itself upon those using the instruments. In other words, the manner in which Boyce uses his instrument to detect engine trouble differs from the results attained by others for whom prior knowledge was claimed.

More Than a Thermometer

As the judge analyzes the invention, it is not a thermometer stuck into the radiator cap to determine the heat of the water, but a device which warns the driver of engine trouble. With this idea in mind, he holds that the center of the invention, therefore, is the selection of the air space or pocket within the inlet of the radiator by which alone the requisite sudden action is given to the thermometer. He says:

> This is quite obvious because, if, as in other arts, the bulb of the thermometer were placed in the water, the rise of the thermometer would be as gradual as the rise in the temperature of the water and no quick signal of impending danger would be given the operator. So also if the bulb of the thermometer were placed in the water, the thermometer would fail to give a correct reading upon the falling of the water level within the radiator.
>
> For example, if the water level should, because of leakage, fall until it is below the bulb, the bulb would then be exposed to air above the water level, which, as before stated, is normally cooler than the water, so that a drop in temperature would be indicated by the instrument instead of the rise in temperature which would actually take place in the water.
>
> Probably the most important advantage of locating the bulb with its thermal responsive element in the air space of the radiator inlet instead of submerging it in the cooling liquid is that it will indicate a condition of danger upon the stoppage of the circulation of the liquid, while the submerged bulb will frequently fail to give such indication. This seeming paradox will be understood when it is considered that the submerged bulb registers the temperature of the water in the radiator, which, upon stoppage of the circulation, gets cooler and cooler in that part of the system and does not respond to the engine temperature.
>
> Accordingly the instrument submerged in the water of the radiator will show a fall in temperature even though the water may be steaming in the cylinder jackets. But if the heat responsive element of the indicator be mounted in the air space above the water level, the steam, as soon as it is formed in the cylinder jackets, will find its way into the air space whether the water is circulated or not, and, therefore, will immediately cause the rapid rise of the indicating fluid and give the desired danger signal..
>
> We are satisfied that the claims of the patent are not limited merely to a "temperature responsive element," or, in other words, to a thermometer placed indifferently in cooling system, but that they embody the novel idea of a thermometer positioned in a new place, where, by reason of the characteristics of the place, the thermometer, even if functioning in an old way, is caused to do a new thing.

Discusses Priority

Having thus given his views on the validity of the Boyce patent, Judge Wooley takes up the question of priority. He reviews four instances cited by the respondent—Fairbanks-Morse, Moore, Avery and Purdy—and declares that "though close to the invention of the patent, it clearly appears that the several users did not intend, and did not observe in their devices, the things intended and accomplished by the device of the patent in suit.

"In other words, they did not have Boyce's inventive conception and, failing to have it, they abandoned their devices before they had passed the stage of experimentation. Therefore, we are of the opinion that the novelty of the invention of the patent has not been negatived by prior use and that, accordingly, the patent is valid."

Frank Briscoe Organizes General Accessories Co.

PONTIAC, MICH., July 23—The General Accessories Co. has been organized by Frank Briscoe, pioneer radiator manufacturer, and will manufacture accessories. It has taken over the plant and die casting equipment and business of the Briscoe Devices Corp. of this city, and is figuring on two other plants which will be operated in conjunction with the Pontiac factory.

Emil D. Moessner, associated with Briscoe for years, and later identified with the Ford Motor Co., will be business manager. Howard G. Harris, owner of a Detroit plating concern, is vice-president.

Ford Soon to Start on Plant in Norfolk

Expected That Factory Will Be Ready for Operation by First of Next Year

NORFOLK, VA., July 24—Construction work on the buildings of the new Ford assembly plant at Newton Park, a suburb of Norfolk, will begin within a few weeks, and the plant should be in operation on or before Jan. 1, 1924, according to M. D. MacTaggert, eastern representative of the Ford company. The factory ultimately will be used as a terminal for shipments to foreign countries, but will start its activities with assembling cars for distribution through Virginia and the Carolinas.

The plant will have a working force of 400 to 600 men in the beginning, and will cover only a comparatively small portion of the forty-four acres which have been acquired and which are on the eastern branch of the Elizabeth River, which is deep water, all bulkheaded and prepared for the erection of terminals.

MacTaggert said that the company's plans for this plant, so far as expansion is concerned, will depend wholly upon the development of the automobile business. The plans are being drawn to provide for ready extension of facilities if it is found necessary to meet greater assembling requirements.

Reports that the assembly plant at Charlotte, N. C., is to be abandoned and moved to Norfolk could not be confirmed.

Ford Plant at Salt Lake

SALT LAKE CITY, July 24—The Ford Motor Co. is to build an assembling plant in this city to cost $200,000. Occupancy is expected by Jan. 1, 1924.

It will handle fifty cars a day and employ seventy-five men, with a monthly payroll of $20,000.

Ford's Eight Millionth Engine Produced July 11

DETROIT, July 20—The Ford Motor Co. built its eight millionth engine July 11, rounding out a million in six days less than six months, and is on its way to another million at the rate of about 7000 engines daily. Engine No. 7,000,000 was built Jan. 17 of this year, when production was approximating 4800 daily. The average for the latest million period was 6711 a day for the 149 working days, or about 166,670 a month.

Under the increased manufacturing schedule the company built its last million in two months less time than its seventh, eight months being required to round out this total. The six millionth passed off the assembly line May 18, 1922. Nearly a year before that date, May 28, 1921, the five millionth engine was built. The first million mark was passed in 1915.

New Studebaker Line Has 3 "Six" Models

Big, Special and Light Show Changes Made from Those of Present Year

SOUTH BEND, IND., July 23—Announcement has been made by the Studebaker Corp. that its line for 1924 will consist of three six-cylinder models, the Big Six, the Special Six and the Light Six.

The Big Six, which has a 3⅞ by 5 in. engine and a 126-in. wheelbase, will be furnished in four models, a seven-passenger phaeton, a five-passenger speedster, a five-passenger coupé and a seven-passenger sedan. All of the 1924 series Big Sixes will carry disk wheels and front and rear bumpers as standard equipment. An extra wheel with cord tire and tube will be furnished with each Big Six model and two in the case of the speedster and sedan.

The Special Six, with a 3½ by 5 in. engine and a 119-in. wheelbase, will be made in two-passenger roadster, five-passenger phaeton, five-passenger coupé and five-passenger sedan models. Changes have been made in the radiator, hood, cowl and body, and minor mechanical changes in the chassis.

The Light Six, with 3⅛ by 4½ in. engine and 112-in. wheelbase, will be made in four models, a three-passenger roadster, five-passenger phaeton, two-passenger coupé-roadster and five-passenger sedan. This car also shows some changes in the chassis and body.

Velie Brings Out Winter Enclosure for Model 58

MOLINE, ILL., July 24—Velie Motors Corp. has developed a glass enclosure for Model 58. It may be easily detached or attached. The expanse of windows gives full view from all seats and the top halves of the windows drop down for ventilation.

Brackets prevent rattling. Shower curtains open with the doors. The top is slightly different from the standard 58 top. The entire equipment is fitted at the factory and cannot be applied to Velie 58 models already in use.

Hupp to Build $350,000 Factory for Subsidiary

DETROIT, July 25—The Hupp Motor Car Corp. will start construction next month of a new factory building in which to house the Detroit Auto Specialties Co., a subsidiary. The new building, which will be completed in January, will give Detroit Auto twice the manufacturing space it had formerly. It will cost $350,000 and is a part of the extensive building and expansion program which Hupp is completing now at the main plant.

The new plant will be located in the rear of the main Hupp factory. The present building, about a mile away, has been sold. By locating the new plant adjacent to the main factory Hupp will eliminate all hauling expense formerly entailed, and improved facilities and equipment will make other economies possible.

The new building will be one floor construction, 504 by 125 ft., and will be divided into two parts, one for manufacturing and the other for receiving and storage. There will be two balconies in the manufacturing section and a third in the receiving. Enamelling formerly done at the subsidiary plant will now be done in the new Hupp enamelling ovens at the main plant by a continuous belt process which takes two and one-half hours.

Aside from the building of its new subsidiary plant, Hupp will get into full operation in its new main factory buildings next month. Many changes have been made in equipment throughout, permitting of increased manufacture and cost reduction. President Charles D. Hastings said the company now has complete control of its major manufacturing requirements.

Moon Starts Producing New Model of Roadster

ST. LOUIS, July 24—The Moon Motor Car Co. has started production on a new 6-40 roadster. Because of the number of advance orders received from dealers the company will apportion distribution for the present.

The new roadster accommodates three passengers. It is finished in Versailles blue, with hand-buffed Spanish leather upholstery, silvered radiator and nickel head lamps. The wheels are disk, with an additional disk wheel mounted at the rear. The top is of double texture black material and top boot to inclose the top when folded back.

The price of the roadster is $1,295.

Price Is Named Receiver for Coats Steam Car Co.

COLUMBUS, OHIO, July 25—John G. Price, former attorney general of Ohio, has been named receiver for the Coats Steam Car Co., upon application of Henry S. Ballard and Hanby R. Jones, who hold a cognovit judgment of $1,537. The bond was fixed at $100,000, which was given.

No statement of assets and liabilities has been made, but the assets are small, as the plant is covered by first and second mortgages. Foreclosure proceedings have been started. The advance payments of agents have been recovered in a rather large amount and the status of these is in controversy.

MOON EXPORTS INCREASE

ST. LOUIS, July 25—Exports of Moon cars for the first six months of 1923 were 25 per cent greater than for the entire year of 1922.

Olds Works to Need More Electric Power

In Letter to City Board, President Hardy Tells of Plans for Expansion

DETROIT, July 25—Writing of power requirements of the Olds Motor Works, beginning in September, President A. B. C. Hardy tells the Lansing Board of Water and Electric Light Commissioners that production at the plant from that time on will require almost double what was formerly used and asks that the company be protected to the extent of 3500 kilowatts.

Wants Nearly Double Amount

His letter outlining the extent of proposed operations at Olds says in part:

Though we cannot yet lay definite demand figures, we have already gone far enough in getting ready for our new and additional manufacturing program, which will be under way during September and increasing from then on until we reach the production capacity of our new machinery equipment, to be able to assure you that we will need for future Oldsmobile production at this plant within a very reasonable time very nearly double the amount of electric power and light that we have utilized in the past.

In addition to additional manufacturing machinery equipment, we are beginning the installation of six continuous-process body enameling ovens, a continuous-process chassis and assembling oven equipment and several continuous-process wheel painting ovens, all of which require heavy electrical power for the operation of the equipment.

We are also having to increase our tool room capacity to match up with the manufacturing capacity. In the sheet metal processes we shall also have to add considerable electric welding equipment. Additional electric power will be demanded to operate material handling and other process conveyor equipment.

Please note that all of the above developments which require additional electric power and light are now away off in the future, but every bit of equipment suggested and much more is being installed now as rapidly as that can be done without disturbing too much our present production of cars and trucks. That is, our demand for additional electric power will be upon you within a very few weeks.

Other Companies Approve

The City of Lansing is voting this week upon the issuance of $1,000,000 in bonds for additional equipment at the municipal power house, and the Hardy letter is cited as evidence of the immediate need. Letters from R. H. Scott, vice-president of the Reo Motor Car Co., and from H. A. Alger, vice-president of the Durant Motor Co. of Michigan, were also cited, to show that the three great automobile manufacturing companies of the city recommended the additional equipment.

Need for the additional power has grown up in the last two years since the city began building its new power house.

Men of the Industry and What They Are Doing

Auten Succeeds Twyman

James E. Auten, for two and one-half years director of purchases, Lafayette Motors Corp., Milwaukee, has been promoted to the post of works manager of the four-cylinder car division of the Nash Motors Co. at Milwaukee. Ben W. Twyman, for four years general manager of the division, and George Bechtel, general superintendent for a similar period, resigned July 15. For six years Auten was identified with General Motors, first as manager of the Liberty motor activities of Cadillac, and later as manager of the Samson Tractor Co. at Janesville. Previously he was connected with the White Motor Truck Co., Firestone Tire & Rubber Co., and Western Electric Co. In accepting the new position Auten declined the offer of the new post of city manager of Janesville, Wis., at $8,000 a year.

Edwards Works Manager for Stearns

H. J. Edwards, formerly with the Cole Motor Car Co. of Indianapolis, has been appointed works manager of the F. B. Stearns Co. of Cleveland and will be in charge of production. Edwards has specialized on Knight engines since 1908, when he recommended the adoption of the sleeve valve idea to the manufacturers of the Stoddard-Dayton, for which he was engineer. In 1912 he formed the Edwards-Knight Motor Car Co., selling his interests a year later to John N. Willys, who retained him as manager and chief engineer of the Willys-Knight factory at Elyria, Ohio. For the last year he has been with the Cole company at Indianapolis.

Coker F. Clarkson in Europe

Coker F. Clarkson, general manager of the Society of Automotive Engineers, accompanied by Mrs. Clarkson and Miss Clarkson, is making an automobile tour of Brittany, to be followed by a journey into Switzerland. He will visit England before sailing for home. Upon his arrival in Paris on the "Paris," Clarkson spent several days in the French capital getting in touch with the leaders of the automobile industry there.

Kotcher Succeeds Hidey

Edwin H. Kotcher has been appointed manager of the body division of the Packard Motor Car Co., succeeding R. M. Hidey, resigned. E. G. Eckert has been promoted to superintendent of the body division.

Peek on "Pittsburgh Plus" Commission

B. F. Peek, vice-president of Deere & Co., Moline, Ill., has been appointed a member of the Illinois commission to work for the abolition of the "Pittsburgh plus" plan in the steel industry. Governor Len Small, under authority of the last Legislature, named the committee, and Peek was chosen to represent the users of steel; B. F. Baker, Kewanee, represents the rolled steel users, and S. H. Thompson, Quincy, the Farmers' Federation.

Castle Joins Davis' Staff

J. L. Castle, formerly general manager of the Standard Motor Parts Co., has joined the staff of the George W. Davis Motor Car Co. of Richmond, Ind., and will devote his time to increasing the efficiency of the Davis service. The company also has appointed R. M. McCormick of Philadelphia as district sales manager, with headquarters in Philadelphia, covering eastern Pennsylvania, southern New Jersey, Delaware, Maryland and Virginia. McCormick formerly was connected with Liberty and later with Chalmers.

Leahy Takes on Travis's Work

Edwin A. Travis, who has resigned as general sales manager of the Locomobile Co. of America, has been succeeded by M. B. Leahy, general sales manager of the Durant Motors, Inc., in other branches.

Blanchard With A. C. Spark Plug

Donald D. Blanchard has resigned as a member of the editorial staff of Motor World, to become identified with the advertising and sales promotion department of the A. C. Spark Plug Co. of Flint, Mich. Blanchard's connection with Motor World has brought him into such close contact with dealers and their many business problems that it qualified him for his new work at Flint.

Dinner for N. A. Wolcott

N. A. Wolcott, president and general manager of the Packard Electric Co., Warren, Ohio, has completed twenty years' service with that concern. To celebrate the event, his fellow executives gave a dinner in his honor, at which W. F. Parker, general sales manager, served as toastmaster. An oil painting of the president by R. E. McClure was presented to Wolcott.

Faltlite Appoints Cohn

L. K. Cohn has been appointed general manager of the American Faltlite Co. of Cincinnati, manufacturer of reflectors for headlamps. For twelve years Cohn acted as factory sales representative for the Corcoran Lamp Co. and the Corcoran-Victor Co., having charge of the latter's offices in Detroit for the past year.

Stone Sells Interests

Harry Stone has severed his connection with the Automotive Products Corp. of Hazleton, Pa., of which he was sales manager and treasurer, selling his and his brother's stock to the Benjamin interests.

Move Made to Revive Trailer Association

Membership Committee Named, Following Meeting When Situation Was Reviewed

NEW YORK, July 23—A reorganization of the Trailer Manufacturers' Association of America is being attempted, following a recent meeting of leading manufacturers, who reviewed the situation thoroughly and appointed a membership committee to bring about the revival of the organization.

Henry M. Wood of the Trailmobile Co. of Cincinnati is chairman of this committee, other members being Charles H. Martin of the Martin Rocking Fifth Wheel Co., Springfield, Mass., and M. E. Crow of the Troy Trailer & Wagon Co. of Troy, Ohio. Headquarters have been established in the United States Realty Building in this city, in charge of Allan P. Ames, who will act as secretary of the committee and handle the affairs of the association through his Trade Association Service organization.

Twenty Members Enrolled

Twenty of the leading trailer makers of the country now are on the membership roll, and an intensive effort will be made to double this membership within the next three months. For the present, until the resources of the industry are fully organized, the association will concentrate its energies upon legislative work, cooperative publicity to truck dealers and users, and the collection and distribution of statistics and other information of interest to the trade.

Those working on the reorganization claim that the trailer industry faces big opportunities for extension. One of the reasons given is the tendency of State legislatures to limit truck loads to a point that will make it more economical to supplement the hauling capacity of motor trucks with trailers. Another reason advanced is the increasing interest in farmer cooperative marketing organizations, which are studying the best means of delivering their products at central selling points.

DAWN-TO-DUSK FLIGHT FAILS

NEW YORK, July 23—The second attempt of Lieutenant Russell L. Maughan to fly from New York to San Francisco from dawn to dusk, attempted last Thursday, failed because of an oil leak which developed in the oil radiator. The army aviator was forced down at Rock Springs, Wyo., after he had completed 1972 of his 2570 mile journey. Had it not been for the oil leak he could have finished his journey before dark.

Steady Gain Shown in Fleet Purchases

General Motors Reports Increase Parallels Growth of General Business

DETROIT, July 24—Sales to fleet owners since the first of the year have shown large increases, according to figures compiled by General Motors Truck Co., a condition almost the opposite from that of the greater part of 1921 and 1922, when practically all truck business was made up of single sales to individuals.

In 1921, 90 per cent of the sales were in single trucks, fleet business becoming evident in 1922 as business generally revived, but single sales through that year were 85 per cent of total business. In January of this year fleet business reached a new high point at 23 per cent and since then has shown a steady increase.

Field representatives advise that good fleet business may be expected through the remainder of the year, and that conditions are especially favorable for increased big business in the next sixty days. The sales chart at the factory shows that increased truck business has paralleled closely increased general business throughout the country.

Ford Sales Total 97,123

DETROIT, July 21—Ford truck sales for the first six months of this year were 97,123, a gain of nearly 90 per cent over the same months of 1922. In June truck sales were 17,774, an increase of more than 6000 over the same month in 1922. The increased business in trucks reflects the prosperity of general business in the United States in a larger degree than passenger car sales, the company declares.

Increasing demand for tractors in general throughout the agricultural sections is reported by the company, about 90 per cent of the total output going to farms and about 10 per cent to industrial users. Sales of Fordsons for the first six months totaled 44,023, an increase of nearly 8000 over the same period last year.

Combined sales of cars and trucks in the United States, which totaled 894,078 in the first six months, represents an increase of 354,975, or about 65 per cent over the same period last year. Increased buying of cars and trucks gives every indication of continuing, the company asserts.

Lincoln sales in the six months' period totaled 3512, which compares with 5242 for all of last year. Sales of Lincoln by months were as follows: January, 631; February, 358; March, 338; April, 625; May, 778, and June, 782.

HARDWARE MEN TO MEET

PHILADELPHIA, July 23—The twenty-ninth annual convention of the National Hardware Association of the United States will be held at the Marlborough-Blenheim, Atlantic City, Oct. 16-19. The automobile accessories branch will have its headquarters at the Shelburne, where its exhibition will be held, commencing Monday, Oct. 15.

ARIZONA'S GASOLINE TAX VETO OVERRULED

NEW YORK, July 23—Word has reached Harry Meixell, secretary of the Motor Vehicle Conference Committee, that the Attorney-General of the State of Arizona has ruled that the Governor's veto of Senate Bill 156, which increased the gasoline tax from 1 to 3 cents, is not legally effective, and that the tax is retroactive against dealers to June 9.

All the gasoline companies in the State will start immediately to collect the 3-cent tax.

100,000 Stars Produced Since August, Last Year

NEW YORK, July 24—One hundred thousand Star cars have been produced in less than a year, six figures being reached today when No. 100,000 came off the assembly rack. The year will not be up until next month.

When the wheels began to turn in August, 1922, the production was at the rate of seventy-three a day; now the several plants devoted to the Durant small car are turning them out at better than 700 a day. Of the 10,000 cars made in the first half of July, 7000 were Stars.

Production of Flints is at the rate of fifteen a day at the present time and up to the 21st, 191 had been manufactured since July 1.

Elgin Makes Plant Ready to Operate in September

INDIANAPOLIS, July 24—Elgin Motors, Inc., the reorganized Elgin company which took over the old Federal motors plant of this city two months ago, has nearly completed the entire rearrangement of the plant to meet the company's requirements. It has also organized its staff and started preliminary work in many departments preparatory to production of cars early in September.

President Joseph H. McDuffee has announced that M. W. Blank, who was production chief for the Cole Motor Car Co. for a period of years, is to be the works manager; George S. Brown, identified with Cole in the purchasing department, purchasing agent, and Walter Blancke, auditor.

Announcement of the sales department personnel will be made shortly, and complete details of the new six-cylinder model which the company is to introduce will be ready for release at the end of the month.

Dealers Report Drop in Used Car Losses

Survey in Eighteen States Shows 10 Per Cent Decline in Second Quarter

ST. LOUIS, July 24—Figures for the second quarter of 1923 issued by the National Automobile Dealers' Association on used car losses show a decline of 10 per cent from the first quarter of the year. In the second quarter dealers reported losses of $21,292,000, as compared with $23,591,000, reported the first quarter.

Reports from eighteen States which were taken as a basis for these figures indicate that sales of used cars since Jan. 1 totaled 1,771,000. Officials of the association had forecast that dealers would have to dispose of 1,800,000 used cars if new car production was kept up to the advance estimates of the manufacturers.

It is not expected that sales of used cars for the balance of 1923 will be on the same scale as in the first six months.

The total number of used cars on hand June 15 was 335,000, a reduction of 16 per cent from the stock on hand in March. There was an average of 8.85 cars in dealers' hands at the end of June, as compared with 10.88 at the end of March. The average capital investment in March was $4,005.43 as against $3,414.46 in June.

The eighteen States used for the purpose of the survey were Tennessee, Arkansas, Washington, Louisiana, Wisconsin, Oregon, Mississippi, California, Michigan, Ohio, Illinois, Missouri, New York, Pennsylvania, Kentucky, Iowa, Minnesota and Indiana. It is estimated that 61.25 per cent of the total population of the United States lives in these States, that there are 64.85 per cent of all automobiles in the country and 62.4 per cent of the automobile dealers in the same States.

The capital investment of the dealers included in this second quarter report shrunk only $630,000, as compared with the $1,391,000 shrinkage recorded in the first quarter of the year.

Rolls-Royce Production to Exceed 500 This Year

SPRINGFIELD, MASS., July 23—Rolls-Royce of America, celebrating its third anniversary July 12, announces a most prosperous half year, with the factory turning out eleven complete vehicles a week. It is expected that this year's production will be between 500 and 600 cars.

Two more direct factory branches have been opened—one in San Francisco under the management of R. B. Jackson and the other in Cleveland, with Fred C. Colwell in charge. This makes five branches in all, with sales offices in Hartford, Conn., and Troy, N. Y., and fifteen representatives in leading cities.

Sees Plane Use Grow as Did Automobile

Government Forecasts Greater Interest by Commuters Within Ten Years

WASHINGTON, July 23—Predictions are made by the experts in the Department of Commerce that within ten years air commuting will be comparatively common in this country, making it possible for people to live 100 miles away from their places of business and make the trip daily without any more difficulty than they experience today when they travel fifteen or twenty miles.

This statement is based on the department's faith in airplane development, which is so great, it thinks, that the flying machines will be used for business and pleasure in the United States within the next decade on a scale commensurate with the extension of automobile traffic between 1905 and 1915. Official recognition of this is found in a statement just issued by the department, which says:

All Communities Benefited

The effect of the airplane, if developed as is expected, will be to extend very greatly the distance to which business and pleasure trips can be made in a given time. Airplanes will permit commuting from distances of a hundred miles, while week-end trips can be made from New York to the Thousand Islands; from San Francisco to Yosemite; from Washington and Baltimore to the mountains of Virginia and from Boston to the Maine woods.

If the visions of the experts materialize, people whose business requires only occasional visits to the city can live almost anywhere, while some of our wealthiest men can spend their winters in Florida and their summers in Nova Scotia and still keep in touch with business interests in New York.

This, the department thinks, will extend the city's influence, increase real estate values and also the prosperity in many of the smaller towns, all of which leads up to the warning that this development will come only if proper landing facilities are provided. It says:

Good Landing Fields Necessary

The flying people go where landing facilities are provided. The town that first provides these facilities should become popular with aircraft, and may in later years be the fashionable resort of the region. Good rail and motor roads, combined with beautiful scenery, have made our fashionable suburbs and summer resorts of today, and, even so, good landing fields, combined with other desirable characteristics, should help make the fashionable suburb and summer resort of the future.

The department then outlines the work undertaken by the Bureau of Standards and the Society of Automotive Engineers in drafting the National Aeronautic Safety Code, which will demand the following requisites in landing fields:

Fields rated as first class will have hangar space, repair equipment, tools, etc.; supplies of fuel, oil, water and spare parts; telephone communication, hotel near and convenient transportation to the metropolis for passengers and freight; attendants at all times; guards to enforce field regulations, obstacle lights, course lights and night ground wind indicators; visible beacon and radio communication.

Fields with less equipment are rated as second, third and fourth class. All fields must have good markings and good runways. In addition, other places for emergency landings should be provided at frequent intervals.

Michelin May Campaign for Straightside Tires

PARIS, July 14 (*by mail*)—A 10 per cent reduction on all tire prices was made by Michelin this week, and was followed immediately by a 15 per cent cut by the French Dunlop Co. Other makers have been obliged to follow the example of these two leaders. There is an almost open trade war between Michelin and Dunlop on French territory, the results of which appear to be more severe for the smaller firms than for the two engaged in the fight.

There are persistent and apparently reliable rumors in France that Michelin will open a big campaign this fall in favor of the straight side tire built in millimetre sizes. Up to the present Michelin has been a bitter opponent of the straight side.

A new combination beader edge cord tire, with the central portion of the tread steel-studded and a rubber strip to each side of it, has just been put on the market by Michelin. The tread is perfectly flat, and the advantage claimed for this tire is non-skidding ability under both wet and dry road conditions.

Final Figures Put Total June Output at 376,882

WASHINGTON, July 21—The Department of Commerce places June production of automobiles and motor trucks, based on figures received by the Bureau of Census in cooperation with the National Automobile Chamber of Commerce, at 376,882, as against 393,192 for the preceding month and compared with 289,011 for June of last year.

Production for the first six months is given as follows, these figures covering the output of approximately ninety passenger car and eighty truck manufacturers.

	Passenger Cars		Trucks	
	1923	1922	1923	1922
Jan.	223,706	81,693	19,398	9,416
Feb.	254,650	109,171	21,817	13,195
March	319,638	152,959	34,681	19,761
April	344,474	197,216	37,527	22,342
May	350,180	232,431	*43,012	23,788
June	336,317	263,027	40,565	25,984

*Revised.

TRUCK MEETING PLANNED

DETROIT, July 24—Motor Truck Industries, Inc., is planning a general meeting of the association, to be held during September at a resort city to be selected by the board of directors within a short period.

Cost $375 to Collect $318,000 Gasoline Tax

Indiana Figures That Return for Year Will Be in Excess of $3,000,000

INDIANAPOLIS, July 24—Indiana's 2-cent gasoline tax brought $317,959 into the State treasury during June, the first month the law was in effect. The returns are supposed to have been reduced somewhat from normal because many users had bought large supplies before the tax went into effect.

While June is normally a big consumption month, Robert Bracken, State Auditor, believes that the collection will be found to be a fair monthly average for the year. On this basis the tax will yield between $3,000,000 and $4,000,000 annually, this sum to be used for highway construction.

The cost of collecting the June installment was but $375, or about one-tenth of 1 per cent of the amount collected. When the law was under consideration by the Legislature, the strongest attacks against it were that the cost of collection would eat up a large amount of the funds.

One Company Files Objection

Collection is being made from wholesalers by agreement; and to date but one large oil company has filed objections to the law. The Sinclair Oil & Refining Co. sent a letter of protest to the Auditor of the State when it paid its first month's installment, objecting to the tax and demanding that the sum it paid be held intact, subject to refund if the law is found to be invalid for any reason.

The Studebaker Corp. of South Bend also filed similar objections, saying the payment was made "involuntarily, under protest and by compulsion of law and to prevent exaction of the penalties threatened." The law is held by the protestors to be in violation of the United States and State constitutions.

The St. Joseph County Circuit Court recently sustained the State's demurrer to a suit brought to enjoin the State Auditor from collecting the tax. Bruce Gafill, president of a South Bend filling station firm, brought the suit. Action has been renewed and date for a hearing set. It is reported that Sinclair representatives have said that, unless there is a refund to them, their case will be taken to court.

OLDS' 26TH BIRTHDAY

DETROIT, July 25—Olds Motor Works will celebrate its twenty-sixth anniversary in August. The company was formed by R. E. Olds in 1897, and the company first entered large production in 1900, when it built 1400 cars. The next year it produced 2500 cars. In 1905 the company built the first two-cylinder car, and in 1906 brought out the first medium-priced four.

Ford Acquires Plant Site in Philadelphia

Will Erect Buildings for Assembling Purposes—Early Start Is Forecast

PHILADELPHIA, July 25—Henry Ford has purchased a site of 100 acres in this city for a plant which he plans to erect for the assembly of automobiles and trucks. The site extends from Sixty-third to Sixty-ninth Street and from Eastwick Avenue toward the river.

William Wallace, assistant manager of the present Ford assembling plant, which for some time has been considered inadequate to the demands of the Ford business here, says that no time will be lost in clearing the new site for the erection of the plant. A definite date for the beginning of the work has not been mentioned.

A bill is to be introduced in the city council this week, providing $20,000 to lay water pipes for the Ford plant. Extensive development is expected in the vicinity of the proposed structure, which at present is partly in a swampy state.

For a time it was believed that Ford might purchase a site at Hog Island, the scene of shipyard activities during the war and for some time thereafter, but it is now known definitely that he has abandoned that plan.

It is said that the present Ford assembling plant will either be sold or turned over to some other use by Ford.

Miniature Incandescent Absorbs Three Companies

NEWARK, N. J., July 23—The Miniature Incandescent Lamp Corp. announces that it has acquired the assets, equipment and licenses of H. J. Jaeger Co. of Weehawken, N. J., making Jaeger's Nitros; the Domestic Tungsten Lamp Manufacturing Co. of West New York, N. J., making Domestics, and the Advance Lamp Works of Chicago, manufacturing Triangle A lamps.

The acquisition of these plants will greatly enlarge the present quota of the Miniature corporation and develop a broader field for its Tung-Sol lamp, which it makes under license from the General Electric Co.

Complete Victory Scored by Willys in Stock Sale

(*Continued from page* 190)

committee's bid, in order to have an advantage over the Tracey bid, should have included some provision for the first preferred stockholders of the Willys Corp. as Tracey's bid did.

Tracey has entered into an agreement with J. P. Cotton, counsel for the first preferred stockholders, to deliver to Cotton free and without expense to him 169,866 shares. Cotton is to distribute 150,000 shares ratably among the holders of first preferred stock, when they deliver their certificates for first preferred stock properly indorsed to Cotton's committee.

An additional option to purchase one share of Willys-Overland common at $12 a share for each share of Willys Corp. first preferred is included in the bid.

The fight for this disputed block of stock has been long extended, lasting for several months, but in each of the legal skirmishes the so-called John N. Willys interests have won.

The first battle came in the spring, when Judge House declined a bid made by the bankers' and creditors' committee because of the wonderful showing being made by the Willys-Overland Co., with prospects of the stock being more profitable with John N. Willys in control than with him out of the picture. Judge Hand, however, left the matter in such shape that other bids were possible later on. This brought about the two bids which came up for consideration by Judge Knox.

Ford Production 40,930 in Week Ending July 24

DETROIT, July 25—Ford production figures for the week ending July 24 totaled 40,930, an increase of 127 over the previous week, which was the former high. Tractor production at the River Rouge plant was 1880. The Lincoln division, with 210 cars built in the week, set a new high mark for this unit and represented an output better than thirty-five daily, which is the highest the plant has yet reached.

Orders from dealers for August delivery are in excess of 300,000, maintaining about the same total as has been evident since the spring months. There is no indication whatsoever of a shading-off in business, officials said, and demand is expected to maintain about the same average through the fall as persisted in the early part of the year. Every section of the country is represented in the buying, the company said, and each assembly branch is working at capacity.

Yellow Cab Will Enter Truck Producing Field

CHICAGO, July 23—The Yellow Cab Manufacturing Co. has entered the truck field and shortly will produce the Yellow Cab Express, designed by Yellow Cab engineers and built to specifications from units made by Continental, Timken, A. O. Smith and Brown-Lipe.

It will be a 1-1¼-ton job, with a four-speed gearbox, pneumatics all around, disk steel wheels and cowl gas tank. The radiator design is similar to that of the Yellow Cab, as are the fenders and runningboard, the latter being of heavy demountable steel stampings. It will sell for $1,740.

Plans have been made for volume production and a separate sales organization created under the direction of W. B. Hambly, formerly with Mack Trucks, Inc.

Ford's Sales Policy Helps Lincoln Sales

Business Is Reported Continuing Several Months Ahead of Production

DETROIT, July 24—Ford policy on Lincoln sales is to appoint certain Ford dealers at different points in large cities, and one or two in all important cities of the country, to make a special effort on Lincoln sales, although all dealers in every community may make Lincoln sales wherever possible. In all cases the deal is handled directly with the factory but the small dealer sells with the understanding that the buyer will get service from the dealer making the special Lincoln effort.

In selecting certain dealers to handle the Lincoln, the company has not done so on a population basis, but rather on a selective system so that all important points will be covered adequately.

For instance, in Detroit there are five Ford dealers who are named special Lincoln dealers. These are located North, South, East, West and centrally. Generally speaking, this would give each a 200,000 population section to draw from, as the city has about a million population, but there are two Ford-Lincoln dealers in Grand Rapids, which has only about 140,000 population.

Exclusive Lincoln Salesmen

Location of special Lincoln dealers depends entirely upon the requirements of the territory. Those selected handle Lincoln in addition to the regular Ford line and in doing so provide separate sales rooms and have special salesmen assigned exclusively to Lincoln sales work.

The regular Ford dealer in the city does not carry demonstrators, has not special salesmen or salesrooms and does not give Lincoln service. In the country sections all Ford dealers are in a position to give a measure of service on the Lincoln and have mechanics who can do general work on them.

For major repairs or complete overhaul, however, the owner must consult the special dealer in the nearest important town.

By it the company maintains a consistent promotion work which would not be the case if the sale were left to the entire dealer organization without definite sales plan. At the same time it permits all dealers to make Lincoln sales. Lincoln business is reported to be continuing several months ahead of production despite the fact that output has been increased twenty to thirty cars weekly by new manufacturing facilities.

LIBERTY TIRE PLANT SOLD

MARION, OHIO, July 23—The Studebaker-Wulff Rubber Co. of this city has purchased the plant of the Liberty Tire Co. of Carey, Ohio, for $43,000 at a receiver's sale.

M. A. M. A. to Change Convention Methods

Instead of Group Gatherings It Will Hold General Session for All Members

NEW YORK, July 24—Planning for the fall convention of the Motor and Accessory Manufacturers Association, which will be held in Boston in September, the program committee has decided on a change in procedure that is expected to enhance greatly the value of the meeting to the 430 members of the association.

Instead of having a series of group meetings, such as were held at Buffalo last year, there will be one general meeting which all can attend and benefit thereby. The Buffalo system divided the M. A. M. A. forces so that each meeting was comparatively poorly attended. Bringing the delegates together as will be done in Boston will pack the meeting, permit of one set of experts, such as the credit men, for instance, learning how their advertising brethren work, and vice versa. Also it is thought a general session will attract more of the big executives.

Rutherford Will Preside

With this idea in mind, the program committee is making careful selections. President W. O. Rutherford will preside over the meeting, and his list of speakers will embrace authorities on most of the problems that confront the industry at the present time.

Roy D. Chapin, chairman of the board of directors of the Hudson Motor Car Co., already has promised to discuss the need for more and better roads. Harold W. Slauson, chief of the engineering service department of the Kelly-Springfield Tire Co., is booked for a talk on city planning and traffic regulations, while Harry Meixell, secretary of the Motor Vehicle Conference Committee, is scheduled to impress on the delegates the need for removing unfair and discriminatory taxes.

Dr. Harriss Invited

Dr. John A. Harriss, New York City's traffic expert and the man who is responsible for most of the traffic reforms in the metropolis, also has been invited to talk. Dr. Harriss is on his way to Europe now to study the traffic situation abroad. Returning in September, he will be primed to tell the M. A. M. A. of how traffic is handled in the European cities.

Another probable speaker is John F. Kelly, Jr., of the Electric Storage Battery Co., who is in Europe now. He is booked to report on foreign conditions as they pertain to the automotive industry.

"Widening the Market for Automotive Products" will be the dominating theme of the convention. Among the factors to be considered are the need for more and better roads, the problem of reducing maintenance costs and increasing service efficiency, the acute need for more space in which to drive and park automobiles in crowded cities, taxation and the world view of motor transportation.

For the first time in M. A. M. A. history emphasis will be given to problems relating to jobber distribution, it being felt by the committee that in considering ways and means of widening the automotive markets, consideration of jobber distribution is of great importance.

M. A. M. A. Members Made $58,067,500 Sales in June, a Decrease of .059 Per Cent from May

NEW YORK, July 25—Reports from members of the Motor and Accessory Manufacturers Association show that sales in June decreased .059 per cent over the preceding month. Total purchases amounted to $58,067,500.

The following table shows the sales by members of the association, the total past due accounts and the totals of notes held for all of 1922 and the first six months of 1923:

1922	Total Sales	Per Cent Change	Total Past Due	Per Cent Change	Total Notes Outstanding	Per Cent Change
January	$17,320,000	20.61 Inc.	$4,450,000	5.45 Inc.	$3,146,000	7.02 Dec.
February	22,720,000	31.17 Inc.	4,070,000	8.57 Dec.	3,483,000	10.74 Inc.
March	28,670,000	26.14 Inc.	2,890,000	28.86 Dec.	2,657,000	23.69 Dec.
April	33,830,000	18.70 Inc.	3,000,000	2.00 Inc.	2,500,000	1.05 Dec.
May	43,700,000	28.06 Inc.	2,900,000	2.75 Dec.	2,450,000	6.05 Dec.
June	42,000,000	3.85 Dec.	2,840,000	1.25 Dec.	2,320.000	5.00 Dec.
July	41,001,670	2.42 Dec.	3,423,850	20.42 Inc.	2,217,670	4.49 Dec.
August	43,700,000	5.00 Inc.	3,705,000	8.21 Inc.	2,398,350	8.15 Inc.
September	37,300,050	13.36 Dec.	4,220,400	13.91 Inc.	2,658,800	10.86 Inc.
October	39,753,800	3.90 Inc.	3,463,850	17.93 Dec.	2,603,100	2.09 Dec.
November	36,616,850	5.51 Dec.	4,245,850	22.58 Inc.	2,442,700	6.15 Dec.
December	34,711,630	5.20 Dec.	3,494,850	17.69 Dec.	1,905,650	21.98 Dec.
1923						
January	45,451,950	30.94 Inc.	2,469,950	29.33 Dec.	1,945,850	2.11 Inc.
February	48,518,700	6.75 Inc.	2,741,100	10.82 Inc.	1,981,950	1.86 Inc.
March	59,428,800	22.49 Inc.	2,129,350	22.32 Dec.	1,929,300	2.66 Dec.
April	61,647,050	4.00 Inc.	2,313,150	8.05 Inc.	1,839,350	5.00 Dec.
May	58,409,550	5.25 Dec.	1,982,750	14.28 Dec.	1,140,150	38.00 Dec.
June	58,067,500	.059 Dec.	2,191,150	10.55 Inc.	1,111,970	2.47 Dec.

Air-Cooled Engine Built by British for Aircraft

WASHINGTON, July 25—Details of a new engine brought out by the Bristol Airplane Co., Ltd., of Bristol, England, and known as the "Cherub," have been forwarded to the Automotive Division of the United States Department of Commerce by the American Consul at Bristol.

Under test the engine is said to have performed a continuous run of fifty hours, developing 15.4 horsepower at 2200 r.p.m. under a 90 per cent load. The average fuel consumption for the entire time was 9.7 pints of gasoline per hour and 0.63 pints of oil per hour.

The engine is a flat, twin type and air-cooled through the medium of a belt-driven fan connected direct to the crankshaft.

NEW GARDNER SEDAN $1,445

ST. LOUIS, July 23—The new sedan model of the Gardner Motor Co. will sell for $1,445. The body construction is patterned closely after the previous model, but changes have been made in the dimensions, body lines, outside finish and upholstery.

Parts Makers Report Only Slight Decline

NEW YORK, July 24—Business with members of the Motor and Accessory Manufacturers was about as good in June as it was in May. Reports show that June sales totaled $58,067,500, as compared with $58,409,550 in May, a difference so slight that June is less than 1 per cent below its predecessor—.059 per cent, to be exact. June of a year ago was $42,000,000, a comparison which tells of the prosperity which now is being enjoyed by the parts branch of the industry.

With business brisk, collections are shown to be excellent, perhaps a shade slower than in May, but good nevertheless. Past due notes in June increased 10.55 per cent, while notes outstanding fell off 2.47 per cent.

Reports from the factories continue to tell of conservatism on the part of the car manufacturers. None seem to be buying very far ahead, there being some cancellations at the present time and some holdups on orders already placed. It is evident, too, that several big concerns are concentrating on July production, calling for supplies now that were to have been used in August and September. While these orders for materials have not been renewed for the fall months, it is felt that the automobile makers are playing safe and not piling up too big inventories.

TRACTORS IN WISCONSIN

MILWAUKEE, July 23—Figures compiled by the State College of Agriculture show that approximately 15,000 tractors are owned by farmers in Wisconsin.

Interest Evidenced in Argentine Show

Probabilities Are That November Exhibit Will Be Best Held in Buenos Aires

BUENOS AIRES, ARGENTINA, June 26 (by mail)—Without doubt the sixth annual automobile show to be held in this city Nov. 1 to 15 under the auspices of the Argentine Automobile Club will far outrank all its predecessors in point of size and brilliancy.

Among the special features will be the spirited rivalry between American and European manufacturers such as has not been present at previous expositions of this nature. French manufacturers in particular have announced their intention of joining forces in the preparation of a special division destined to display to advantage all models of French cars. This is an initial step in the campaign to regain for France the place she once held in the Argentine market.

Other Nations Interested

In addition, the Governments of Belgium, Italy and Spain have solicited full details regarding the show from the secretary of the club. This is the first time that foreign governments have taken a direct interest in the Buenos Aires exposition.

The first circular sent out by the club inquiring of local importers their intention of taking space brought back immediately twenty-five replies in the affirmative. Among these importers are those representatives of the Buick, Ford, Overland, Studebaker, Chevrolet, Marmon, Lincoln, Essex, Maxwell, Hudson, Duesenberg, Nash, Cadillac, Case, Packard, Fiat, Renault, Peugeot, Lancia and Opel.

The list is being added to almost daily and within a short time the organizers of the show hope to have requests for space reservation from every importer of automobiles, trucks, tractors, tires and tubes, accessories, oils, etc., of any importance in the entire country.

Housing Facilities Inadequate

As in years gone by, the show will be handicapped by the lack of adequate facilities for housing properly all the products to be shown. Some time ago, in order to do away with this obstacle, the executive board of the club addressed a formal note to the mayor of Buenos Aires petitioning for the grant of a site suitable for the erection of an exposition building large enough to contain all the exhibits of the annual automobile show.

In the meantime a group of Argentine capitalists is considering the erection of a building in Buenos Aires which will correspond to the Madison Square Garden in New York.

In turn it would seem that the city council of Buenos Aires, together with the mayor, are beginning to give the question of adequate quarters for industrial exhibits serious study. The mayor in his recommendations to the council concerning the projected loan for consolidating the municipal floating debt and the carrying out of public works advocates the setting aside of funds required for the proposed Palace of Industry in which it is planned to hold an exposition for the purpose of stimulating domestic industry.

In view of the comparatively flourishing condition of the automotive trade in Argentina at present and the splendid prospects for the future it is safe to assume that no American or European manufacturer interested in the Argentine automotive market will overlook the advantages that will accrue to him through exhibiting his products.

Particularly is this to be inferred when it is remembered that the various chambers of commerce composed of nationals of foreign countries engaged in the manufacture of automotive goods are all supporting the show by making recommendations to the home manufacturers that they cooperate effectively with their local representatives in securing the best possible showing.

June Sales in Indiana Showed 8 Per Cent Drop

INDIANAPOLIS, July 25—June sales of new cars and trucks in Indiana fell off 8 per cent as compared with May, with 11,788 passenger cars and 759 trucks sold during June. This total of 12,547 new motor vehicle sales is 1101 below the May record, but it is really a delivery record and not a pure sales mark, as there was a marked shortage in Fords, for instance, in many quarters.

Rural sales conditions are not improving. With wheat at low figures, causing an actual loss to farmers, and a light hay yield and with hogs still $3 a hundred under last year's prices, the outlook for large fall sales of cars to Indiana farmers is far from good. On the other hand, the report of the United States Department of Agriculture statistician for Indiana just issued reports corn in splendid condition and this is one of Indiana's big and profitable crops.

The report of the motor vehicle department for the State shows that with 57,083 new cars and trucks sold during the first six months in the State, the number of dealers increased 467 over the comparative figures of the same date last year. There were 1990 licenses issued to dealers by the end of June. With nearly 500 more dealers than there were last year competition for fall and rural sales will be brisk.

DISALLOWS PAN CLAIM

DECATUR, IL., July 21—Judge Baldwin, after a day devoted to arguments, sustained the master's report that a claim for $10,000 filed by the International Bankers' Corp. against the Pan-American Motors Corp., be not allowed. An appeal has been taken, and pending this litigation full settlement of the Pan-American's affairs is held up.

Makers See Decline Lasting Two Months

Reeves Reports on Conditions After Visit to Detroit, Flint and Lansing

NEW YORK, July 23—Although orders are still being received in good volume by car manufacturers, it is apparent that the usual seasonal decline is here, although not to so great an extent as in previous years, reports Alfred Reeves, general manager of the National Automobile Chamber of Commerce, just back from the monthly meeting of the directors of the N. A. C. C. at Buffalo, following which he visited Detroit, Flint and Lansing.

Reeves says the feeling is that there will be a slowing down for the next two months but that the year itself, taken as a whole, will be the best in the history of the industry.

Speaking of conditions, he says.

I was told that there is a surprising amount of buying among the farmers, despite the low price of wheat. Southern business is brisk, helped by cotton, while all dealers are decidedly optimistic. There are a few cases of slow movement on the part of open cars but I believe they all will be cleared out in a couple of months.

The demand for closed cars, of course, more than keeps up with production. I find, too, that the manufacturers are decidedly conservative in their every move. Inventories are being watched.

There is a feeling in the trade that the world at large has been well sold on the motor car and that mass salesmanship has produced results. By that I mean that a dealer, finding he cannot sell his prospect his own particular make, urges that he buy some other—anything to get him to buy some automobile on the theory that once sold he always will want a motor car.

Our big problems are first, the reduction in the number of accidents which can come by education; second, the relief of congestion of traffic which is so bad in cities over 100,000; third, watchfulness against overtaxation and, fourth, highways, more of them, better ones and the honest expenditure of funds appropriated for highways.

The industry is at work on all of them and has made progress on all except traffic. So serious is that problem that we are about to offer prizes for the solution of the traffic situation.

Newspaper Men to Hear Buick Plans for Year

DETROIT, July 23—Buick Motor Co. will hold a series of meetings in important cities of the country this week, at which newspaper men will be acquainted with company policies on advertising and news releases during the fiscal year beginning Aug. 1.

The meetings will be addressed by factory representatives wherever possible, and by retail branch managers in other cities. The company initiated this system of outlining confidential information last year.

Dealers in Michigan Start Rural Canvass

They Will Make Effort to Line Up Farmer Business in Next Few Months

DETROIT, July 23—Distributors in Detroit district report that their dealers throughout the State beginning today will make a thorough canvass of the rural districts in a determined effort to line-up farmer business during the next few months. Farm conditions in Michigan are reported to be unusually good, general crops being well advanced and prices in most parts of the State high. There is a scarcity of help in many of the farm sections, but aside from this conditions are good.

Farm buying through the early part of the year has been light, the greatest part of business in the State having come from the industrial sections. There has been a scattered buying from the farms, but it has been for the most part in light cars. Farmers throughout the year have manifested a great deal of interest in cars and have been well represented in the attendances at shows held under the auspices of the Michigan Automotive Trade Association.

Because of the farm interest in cars, and the statements of many farmers that they would be in the market if crops and prices were satisfactory, the sales organizations of the State are now getting busy. Salesmen are being especially assigned to work the farms, and dealers declare they expect to round up a great deal of business. Wheat in this State is relatively unimportant, and farmers are well protected through the general diversification of crops.

Detroit United Railways Enters Hauling Business

DETROIT, July 24—The Detroit United Railways has decided to engage in the general freight hauling business with motor trucks and trailers in order to extend its business into sections not conveniently reached by rail.

Trucks and trailers of the demountable packing case and demountable body types will be used, so that these containers may be hauled by motor, by trolley or by a combination of both.

Freight and express packages will be hauled to a terminal in Detroit or Flint, for example, where the loaded bodies and packing cases will be transferred to the trolley equipment, carried to destination via the railway track and at destination transferred again to trucks for individual distribution.

Each flat car can haul four or five truck bodies, or twenty or more cases.

JIMMY MURPHY GOES ABROAD

NEW YORK, July 24—Jimmy Murphy, American automobile racing champion, sailed today on the Aquitania on his second invasion of Europe, taking with him his mechanic, Ernie Olson, and the Miller Special which he will drive in races abroad. Murphy is booked to drive in the Monza race in Italy in September and again in Spain a few weeks later. The speedway star is suffering from blood poisoning, his left knee having become affected through an injury received while working on his car.

American Bosch Expects August to Be Peak Month

SPRINGFIELD, MASS., July 23—Following a meeting of American Bosch Magneto Corp. branch managers in New York, A. H. Bartsch, general sales manager, declares that the sentiment was expressed that, while the best half of the year has passed, the peak month for accessory sales is still to be established. This probably will be August, he thinks. There is an indication that the six months to come at no time will show smaller sales than the corresponding months of last year. In fact, Bartsch says, the meeting showed confidence that each month to come would register a decided and material improvement over that of any corresponding month of record. During the first half of the year, sales made by Bosch branches exceeded those of 1922 and even those made in 1919 and 1920.

Victor Motors Organized to Make Truck, Cab, Bus

ST. LOUIS, July 24—Victor Motors, Inc., has been formed with a capital of $3,000,000 to manufacture light and heavy-duty trucks, taxicabs and buses. Offices are in the Arcade Building. Guy Wilson is president and Sherman S. Dorsey, vice-president and chief engineer.

Six truck models are contemplated, the first model having been completed. This has a capacity of 1500 to 2500 lb. It has a wheelbase of 131 in., a 4 x 5 in. L-head engine, Zenith carbureter, electric starting and lighting system, thermo syphon cooling, cellular radiator, Fuller three-speed gearset, multiple disk clutch, Columbia axles and a propeller shaft brake operated by the hand lever. Pneumatic cord tires, 33 x 5, are used on all four wheels.

The price of this first model is $1,200.

100 Per Cent Sales Gain for Stutz in Half Year

INDIANAPOLIS, July 23—Reporting for the first half of the year, the Stutz Motor Car Co. of America states that retail selling has increased monthly since Jan. 1, 1923, the highest single gain recorded for any month being 261 per cent over the best previous month.

In the aggregate the sales for the half year indicate more than a 100 per cent gain over last year, more cars having been shipped from the Stutz factory during the first six months of 1923 than during all of the previous year.

Atlanta Experiences Its Best Half Year

Car and Truck Business 25 Per Cent Better Than in Six Months of 1922

ATLANTA, July 24—A careful investigation of retail automobile and truck sales in the Atlanta territory for the first six months of 1923, conducted among the dealers in Atlanta handling the better known cars and trucks, shows the gross business to have been from 25 to 30 per cent better than the first six months of 1922, and probably about the most prosperous six months the industry has ever enjoyed in this section.

Among the Ford dealers business has been probably around 40 per cent better than last year, and without doubt the best volume Ford dealers have ever enjoyed in this section. The Ford weekly payment plan has brought a remarkable increase in business the last two months, and all dealers in the territory are far behind in their orders. Chevrolet dealers also report a large increase, though not proportionately as great as that of Ford dealers.

All Classes Increase

In the medium-priced class the average increase has been around 30 per cent over last year, with most of the dealers stating the first half of the year witnessed the biggest volume of sales they had ever enjoyed.

In the higher-priced class the increase has averaged around 20 to 25 per cent.

In truck sales the average increase appears to have been around 30 to 35 per cent, as a whole, with truck volume undoubtedly the best dealers have ever enjoyed in this section. This is due to the general revival of business.

Lighter trucks have been by far in the biggest demand, with this business, dealers advise, at least 40 to 45 per cent better the first six months of 1923 than the first six months of 1922. There has been an increase the past month in light truck sales, and indications in mid-July are that the present month will prove the biggest of the year to date.

Equipment Sales Good

In tire and equipment sales in the territory both jobbers and retailers report a substantial increase the first six months of this year, most of them agreeing that the increase has been around 25 to 30 per cent. As a whole this business undoubtedly has been better the first half of 1923 than ever before in this district over a similar period.

The increase among the smaller town retailers, jobbers here state, has been better than 40 per cent, due to improved agricultural conditions and the increase in the buying power of southern farmers. All the jobbers are looking for 1923 to prove the biggest year in the history of the industry in this section.

U. S. Exports Doubled During Fiscal Year

Gain in Automobile Shipments Reported as 66,959 and Value $40,941,896

WASHINGTON, July 25—Automobile exports from the United States were doubled in the fiscal year ending June 30, according to figures compiled by the Bureau of Foreign and Domestic Commerce. The gain in shipments of automobiles, including chassis, amounted to 66,959 in volume and $40,941,896 in value as compared with the previous fiscal year.

The total declared value of 119,293 cars exported during the twelve months ending June 30, 1923, amounted to $83,841,066. Only a slight gain was registered in imports, the net increase being 174 cars with a gain in value amounting to $168,404. Total imports of automobiles and chassis in the fiscal year of 1923 amounted to 624 with a total value of $925,673.

Exports of automobiles, including chassis, for June, 1923, amounted to 14,527 with a value of $10,130,183, an increase of 5551 automobiles and a gain in value of $3,477,664 as compared with June of last year.

Classification of exports show that 100,690 passenger cars, except electric, were shipped from the United States during the fiscal year of 1923, having a declared value of $72,332,506, which was more than double the volume and value for last year. Shipments from Canadian plants and Ford foreign assembly figures are not included in these classifications.

There were 18,320 motor trucks and buses exported during 1923, having a declared value of $11,133,786, an increase of 10,892 vehicles and $4,610,979 in value over the twelve-month period of 1922.

No comparisons are possible at this time regarding exports of automobile parts, accessories, etc., as new classifications for exports did not become effective until last fall.

Carrier Law May Have California Court Test

LOS ANGELES, July 14—California's much vaunted laws governing the operation of motorized common carriers probably will be subjected to court tests this summer. This is due to the feeling that some of the permits constitute a practical monopoly. Shippers claim they are at the mercy of the holders of these certificates and they are not privileged to deal with others.

One certified holder in Southern California practically controls eleven different routes. He is permitted 48 hours in which to meet the requirements of shippers. During this time, if his own equipment is otherwise engaged, he is privileged to rent other trucks. It is alleged that when he does this, the truck owner does not receive the full compensation that the holder of the franchise does. Consequently he is at a disadvantage.

The Railroad Commission, which has authority over all matters of this kind, has notified a number of truck operators working under contract in competition with the certified carriers that they must desist.

The contract carriers claim to be beyond the authority of the commission, inasmuch as they do not operate over a regular route and between fixed termini, except in fulfilling the contract, that they do not accept consignments from more than one party at a time, and that they do not make a back haul.

It is reported some of the contract carriers have organized and will defend their operations by fighting the ruling of the Railroad Commission through the courts. They say they are anxious to abide by the law, but think the commission is incorrect in its interpretation.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

The midsummer lull in trade continues, uncertainty and caution characterizing most markets. A moderate upward tendency in stock quotations was noticeable during the past week.

Crop prices in general have shown increased strength. Favorable weather reports from Texas, however, have caused a sharp break in cotton, and last week's improvement in the wheat market suffered a slight setback on Monday.

The index of the Bureau of Labor Statistics for June indicated a drop in wholesale prices of 2 per cent from May, but Fisher's index recorded no change for the past week, this being the first time since June 9 that a weekly recession has not been noted.

Cotton spinning in June, as measured by active spindle hours, declined 10 per cent from May, according to the monthly report of the Census Bureau. The June figure, however, was nearly 10 per cent higher than a year ago.

A further easing of the labor supply is reported as a consequence of decreased production in several lines.

Bank debits to individual accounts as reported by the Federal Reserve Board for the week ended July 18 aggregated $9,273,000,000, a decline of about 5 per cent from the preceding week, but a gain of 3 per cent over the corresponding period last year. Bradstreet's figures for bank clearings indicated a drop of 6 per cent from the week before and of 2 per cent from last year.

Discounts by the Federal Reserve banks declined $40,500,000 in the week ended July 18. This drop was accompanied by a decrease of $25,400,000 in member banks' reserve accounts, and of $48,200,000 in Federal Reserve note circulation, which, combined with a gain of $6,300,000 in reserves, brought up the reserve ratio from 75.4 to 76.5 per cent.

FINANCIAL NOTES

Jenkins Vulcan Spring Co. for the first six months of this year reports sales 40 per cent greater than for the same period in 1922. It also states that with factory branches in Atlanta, Boston, Dallas, St. Louis, San Francisco, Seattle and Portland, it now has nation wide service for dealers and car owners. Its financial statement as of April 30 shows assets of $695,283 made up of: Cash, $23,745; notes and accounts receivable, $124,312; finished product and work in process, $220,311; steel and other materials, $125,140; plant and equipment, $176,501; deferred debits, etc., $24,353; patents, trade marks, etc., $917. Liabilities include: Notes payable, $90,000; accounts payable, $3,893; accrued liabilities not due, $6,852; preferred stock, $150,000; common stock, $269,000, and surplus and reserves, $175,591.

Stewart-Warner Speedometer Corp. has declared a quarterly dividend of $2.50 a share, payable Aug. 15 to stock of record July 31. The last payment was $2 with an extra of 50 cents. Earnings for the three months ended June 30 were $2,395,390, before deduction of Federal taxes, and $2,111,372 after taxes. For the first six months the total earnings were $4,464,330 before tax deduction and $3,939,346 after, making approximately $8.30 a share after taxes. The company reports cash and securities as of even date as $5,806,000, with no outstanding bank loans, preferred stock or bonds. The only obligation is current bills.

Chas. Jurack Co., Milwaukee, a pioneer pattern manufacturer, has added a complete die-casting plant and is handling a large volume of orders for aluminum and white brass parts, rough and machined, from the automotive industries. The company at present is doing some additional financing to take care of the new department and increased business as well as to provide for more equipment. The earnings for the last thirteen years have averaged 16.7 per cent, it is stated, with regard to the offering of stock.

Reading Rubber Co. has leased the town hall in Fleetwood, Pa., for manufacturing automobile tubes and other products. The minimum capacity will be 1,000 tubes a day and the maximum, 5,000. New machinery will be installed at once and the remodeled hall, with an addition, will mean the expenditure of $100,000.

White Motor Co. has declared its regular quarterly dividend of $1 a share, payable Sep. 30 to stock of record Sept. 20. It is expected that the report for the first six months of the year will show the best earnings in the company's history for any previous similar period.

H. H. Franklin Manufacturing Co. has declared the regular quarterly dividend of $1.75 a share on its 7 per cent cumulative preferred stock, payable Aug. 1 to stockholders of record July 20.

G. M. ADDITION IN CANADA

DETROIT, July 24—General Motors, of Canada, Ltd., is building a unit 200 by 130 ft. as an addition to the Oldsmobile factory of the Oshawa group. The building will be completed Nov. 1, when Olds will go into manufacturing on a large scale at the Canadian plant. At present the plant is primarily an assembly unit.

METAL MARKETS

While the quiescent state of the steel industry is becoming more and more pronounced from day to day, the market is also utterly devoid of what is commonly referred to as selling pressure. What few price concessions come into view are rather of shading than slashing proportions. Several causes contribute toward a postponement of that day when either consumers must come forward and uncover, more so than they have done so far, their late third and fourth quarter requirements or when producers must come out in the open with prices that appeal sufficiently to buyers to rouse them out of their present apathy.

As conditions are today, the necessity of the latter stratagem looms as far more of a probability than the return of buyers of representative tonnages to the market place on the basis of present price levels. Outstanding among the causes for a lack of more aggressive competition for orders at this time is the booking by the smaller independents, without very much effort, of what little in the way of fresh orders comes out. The larger mills are still obligated for sufficient tonnages to make possible rational operating schedules. New business is not only of slight proportions, but, moreover, is as a rule of the "rush shipment" kind, and more likely than not would throw out of gear the operating schedules of the larger producers.

Hence they permit it to go to the smaller mills, whose order books have so many blank pages that they can accommodate nicely those in want of small tonnages for immediate consumption. The larger interests in the steel industry recognize that the psychological moment has not yet come when price reductions might get buying once more under way. They are waiting for a clearer view of the outlook. The fuel situation, although no longer giving cause for alarm to the steel industry, which is prepared for any emergency, is still hazy in so far as concerns the industrial consumer generally, and recurring difficulties in obtaining sufficient coal might curtail the consumption of steel. It also remains to be seen how relations with labor will turn out. Pending a more settled state of affairs all around, steel producers are inclined to be extraordinarily conservative. This policy is being pursued not only with reference to selling prices but also in the purchase of their own raw material. Two months ago the second largest independent bought between 50,000 and 60,000 tons of heavy melting steel scrap at around $22. Since then there has been no representative sale of this material, although the market has declined $4 to $5. A resumption of scrap buying would portend renewed activity in the market for finished steel products. So far there are no indications of such buying.

Pig Iron.—Inquiry from automotive foundries is virtually nil. The market is neglected at the present inviting prices. Melters appear to be wedded to the practice of buying in a rising market and spurning cheap pig iron.

Aluminum.—Small lots of imported metal continue to arrive against previously placed orders. The market holds firm with very little fresh activity.

Copper.—Consumers are again holding off, and the market rules dull.

R. P. HICKS DEAD

MINNEAPOLIS, July 20—The funeral of Rex Parker Hicks, former vice-president of the Hicks Tractor Co. of Chicago, took place on July 17. Mr. Hicks died at his summer home at Navarre, Lake Minnetonka. At the time of his death he was engaged in making caterpillar tractors for use in grading and heavy duty work.

INDUSTRIAL NOTES

Seamless Tube Co. of Wisconsin, with headquarters in Appleton, has been granted a charter. The authorized capital is $400,000 and the incorporators are A. G. Brusewitz, Mathew Rossmeissl and William Geenen, who were principals in the acquisition of the plant and property of the defunct Reliance Motor Truck Co. of Appleton some time ago and will operate in this shop group.

The **Perfection Light & Battery Co.** has completed its factory in Atlanta, Ga., starting operations the latter part of July. The plant was moved to Atlanta from Chicago, and manufactures batteries for practically all makes of automobiles. Two service stations also were opened by the company in Atlanta.

All Studebaker Plants Operating at Capacity

NEW YORK, July 25—In a statement issued here today A. R. Erskine, president of the Studebaker Corp., declares that he sees no present indication of a let-up in the automobile trade; states that all Studebaker plants are operating at capacity and that his company is expending $6,000,000 in its expansion program.

"Last week the Studebaker Corp. turned out 3412 cars, and during the first six months of 1923 the total was 81,891, compared with 60,053 in the same period last year," Erskine said. "We are turning out 350 a day in South Bend and 275 in Detroit.

"The corporation is spending $6,000,000 in its new improvement and addition work which will be finished on schedule time, as the management sees no present indication of a let-up in the automobile trade."

Federal Complaint Issued Against Exporting Firms

WASHINGTON, July 25—A complaint against the Pacific Commercial Co. and the Exporters and Importers Association of the World, both of New York City, has been issued by the Federal Trade Commission, charging them with having accepted orders and received payments from foreign customers for first class new automobile chassis and substituting in shipment second-hand equipment.

The concerns are engaged in export business, and the commission charges that they have been exporting "second-hand, inferior and worthless goods." The respondents' acts, the commission alleges, are injuring and damaging the reputation of responsible automobile exporting firms who are fulfilling their contracts to the letter.

Companies Ordering Steel at Late Date

Pittsburgh Sees Dangerous Situation Due to Shipping Troubles That May Arise

PITTSBURGH, July 20—Steel men, in the face of a predicted buying movement, probably in September, see a dangerous situation created by branches of the automotive industry allowing their stocks on hand to be run down. It is pointed out in this connection that many parts makers are operating with one month's supply of steel on hand.

The parts makers state that they are running down their stocks due to the easier deliveries of steel and the fact that many automobile companies have held up specifications on parts until the plans for new models are completed.

It is quite true that semi-finished steel and sheets, for example, may now be secured within three or four weeks, but a tie-up in transportation, a strike, or some similar occurrence not considered improbable in the steel industry, may change the situation quickly, even over night, as some steel men have seen it happen.

At the present time there is a possibility of a car shortage for sheets as the movement of box cars westward for the grain movement gathers momentum.

Steel men also declare that the specifications for the new steel sizes direct from the automobile companies themselves have not all arrived, even at this late date. One of the largest interests catering to the automobile trade declares that it still has one large automobile concern to send in its specifications.

Two concerns which have outputs of 650 cars a day and 500 cars a day, respectively, have just come in, both about a month late. The latter had some extensive changes in its body design.

The usual experience in the steel trade here is that the specifications are late and then there is a grand rush to have steel delivered.

ONLY ONE TAX IN MEXICO CITY

WASHINGTON, July 25—Authorization of a two centavos tax per litre on gasoline sold in Mexico City has been asked by the Department of Hacienda, according to information received by the Automotive Division of the Department of Commerce. The gasoline tax will eliminate the regular automobile license plates and will mean only the one tax on automobiles operated in Mexico City.

REO PHAETON REDUCED $100

LANSING, MICH., July 26—A reduction of $100 in the list price of the five-passenger phaeton, and the discontinuance of the seven-passenger phaeton, have been announced by the Reo Motor Car Co. The new price on the phaeton, effective immediately, is $1,545.

Calendar

SHOWS

Nov. 4-10—New York, First Automobile Exposition of the Foreign Automotive Association, Hotel Astor.

Nov. 11-17—New York, Annual Automobile Salon, Hotel Commodore.

Jan. 26-Feb. 2—Chicago, Annual Automobile Salon, Hotel Drake.

FOREIGN SHOWS

Sept. 28-Oct. 7—Berlin, Automobile Show.

Oct. 4-14—Paris, Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.

Oct. 15-20—London, Motorcycle Show, Olympia.

Oct. 24-Nov. 2—Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

Nov. 1-15—Buenos Aires, Annual Automobile Exposition, under the direction of the Automovil Club Argentino.

Nov. 2-10—London, Automobile Show, Olympia.

Nov. 22-Dec. 1—London, Motor Transport Exhibition.

Dec. 8-19—Brussels, Passenger Cars, Trucks, Airplanes and Motor Boats, Aviation Palace.

RACES

Sept. 3—Annual Pikes Peak Hill Climb.

Oct. 28—Barcelona, Spain, Grand Prix for vehicles of 1500 c.c.; Nov. 1, International Grand Prix for cycle cars of 1100—Nov. 4, International Grand Prix for two liter.

CONVENTIONS

Oct. 24-26—Cleveland, Thirtieth Annual Convention of the National Association of Farm Equipment Manufacturers, Hotel Statler.

Nov. 12-17—Chicago, Annual Business Exhibit and Convention of the Automotive Equipment Association, Coliseum.

S. A. E. MEETINGS

Oct. 25-26—Production Meeting of the S. A. E.—Cleveland.

Jan. 1924—Annual Meeting of the S. A. E.—Detroit.

MEETINGS

Sept. 19-21—Boston, Fall Meeting of the Motor and Accessory Manufacturers Association.

Porto Rico $300,000 Richer by Licenses

SAN JUAN, PORTO RICO, July 17 (*by mail*)—Automobile licenses brought between $300,000 and $350,000 into the insular treasury during the fiscal year ended June 30. This compilation has been made by the Division of Automobiles, which also states that approximately 8000 cars and trucks are now in operation. Six thousand licenses were issued during the year, and an additional 3000 transfers were made of used cars.

The newly formed Insular Motor Corp. took over, as of July 1, the assets and liabilities of the long-established firm of Santiago A. Panzardi, Inc., and will move into new quarters on Covadonga Avenue. The new company will continue the distribution of Packard, Buick and Chevrolet lines, as well as Goodyear tires. J. F. Hitchman, who at one time was director of the National Bank of Santo Domingo and of the Santo Domingo Motors Co., in the Dominican Republic, has been made manager.

The Hudson and Essex distribution, which formerly was held by the Panzardi company, was taken over some months ago by the Hudson & Essex Motor Corp., Ltd. Panzardi, as well as other stockholders of the old firm, are now with this company.

G. M. Some Time May Start Farm Implement Making

JANESVILLE, WIS., July 23—While not in immediate prospect, there is liklihood that General Motors may resume the production of Janesville farm implements, due to the steady improvement in this field. The manufacture of Samson tractors, however, will not be resumed in Janesville, but a force of from eighty to 100 is being maintained to handle service parts, of which $3,000,000 worth are in bins to serve Samson tractor owners all over the world.

When General Motors established the Samson tractor plant in Janesville, it acquired the Janesville Machine Co., a pioneer implement manufacturing concern, both to get facilities and close connections for tractor implements. The great Samson plant is now used to assemble Chevrolet passenger cars, while the implement unit is intact and could quickly be put into action.

The former Waukesha Malleable Iron Co. plant at Waukesha, Wis., which was leased in 1920 for five years by General Motors to serve the Samson plant in Janesville with malleable castings, is now operating with a maximum force of 325 men on parts for Buick and Chevrolet.

More Tractors Shipped to Southwestern Points

MILWAUKEE, July 23—The fourth trainload movement of tractors from the main works of the Allis-Chalmers Manufacturing Co. at Milwaukee to the Southwest, since Jan. 1, left the plant during the past week. It consisted of forty-three carloads, containing 187 three- and four-plow machines. At Kansas City the train was broken up for distribution by carlots to various points in Nebraska, Kansas, Colorado, Oklahoma, Texas and New Mexico. En route to Kansas City, the train was stopped at all important cities for inspection by dealers and farmers.

In April Allis-Chalmers shipped two complete trainloads to the Southwest, and the June production went forward by special train to Fargo, N. D., where its arrival was timed to inaugurate the "Prosperity Week" endeavor. R. C. Brewsaugh, advertising manager of the tractor division of Allis-Chalmers, and other officials have accompanied all trainload movements.

Georgia Bill Permits Rail Lines to Use Buses

ATLANTA, GA., July 24—A bill has been introduced in the Georgia State Legislature to make it legal for city street car, interurban and railroad companies to operate motor transportation lines in this State, due to the fact that a number of the public utilities in Georgia have recently announced their intention of establishing motor bus lines to augment their present service.

The bill is meeting with considerable favor and little opposition, and will likely pass the present session.

France Will Conduct Engine Competition

PARIS, July 14 (*by mail*)—On the initiative of the State Agricultural Department, an internal combustion engine competition running on vegetable and tar oils will be held in France this year. While open to all French citizens, foreigners can take part in the competition on permission being given by the Minister of Agriculture.

The trials are for Diesel and semi-Diesel type engines, suitable for general farm work and having a maximum weight limit of 55 lb. per hp., and for the same type of engines without a weight limit. In each of these two classes the engine will be divided into three divisions with horsepower of 1 to 10, 10 to 25 and 25 to 40.

Any kind of fuel can be used providing the basis is at least 70 per cent vegetable or tar oils. Two series of trials will be held, the first being intended to prove the regularity and reliability of the engines or the carbureter devices adapted to them, and the second being to demonstrate the fuel economy.

The object of the trials is to encourage the development of engines suitable for agricultural purposes, which are independent of imported fuel.

Belle City Malleable Iron to Start Plant Additions

RACINE, WIS., July 23—Both the better outlook for business and the failure of radical tax legislation in Wisconsin have induced the Belle City Malleable Iron Co. to reinstate several portions of its general plant replacement and enlargement project, involving $800,000, which some time ago were ordered held up.

The decision means that the erection of a new foundry costing $250,000 will be started at once. It will be 115 x 360 ft., and double the present melting capacity. During the past year a new core and mill building costing $125,000 and a new annealing building valued at $275,000 have been added.

A new building, 150 ft. long, connecting the annealing shop to the shipping building, will also be erected at once, instead of later.